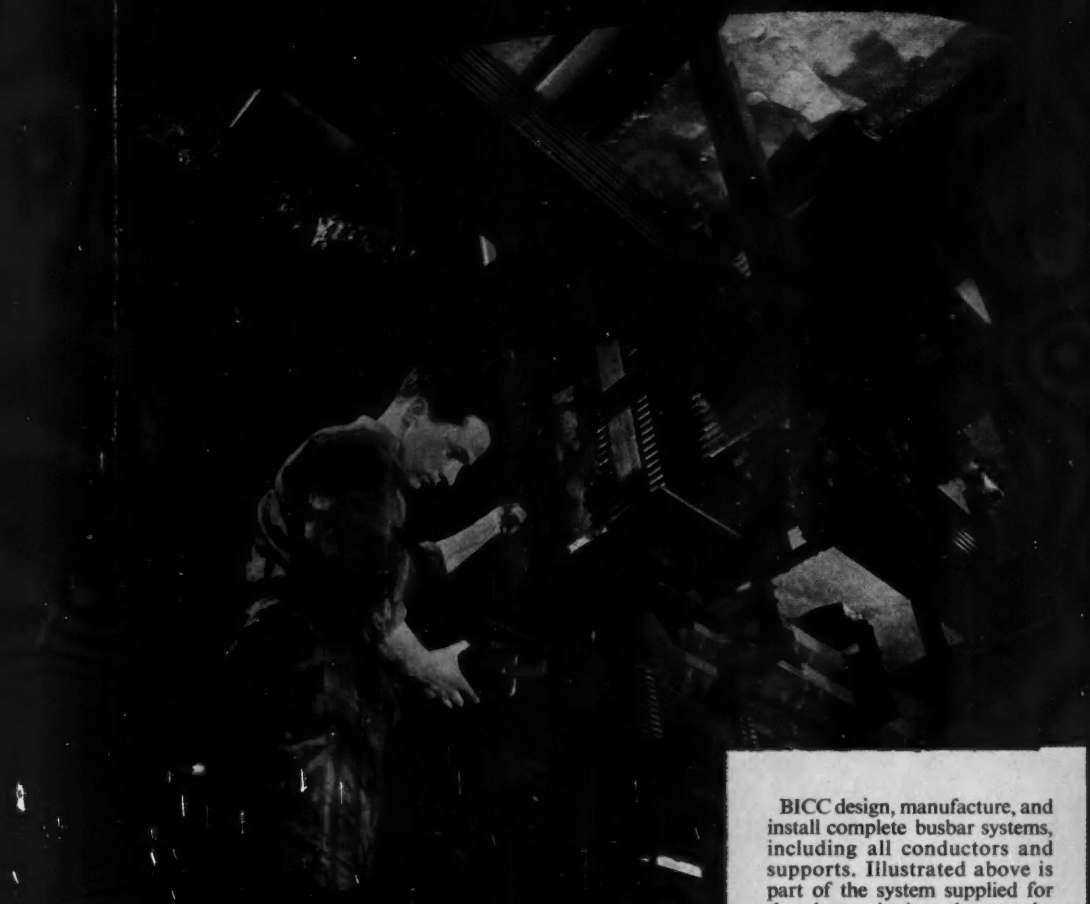
11 NOVEMBER 1954 NINEPENCE

ELECTRICAL TIMES



COPPER BUSBARS by BICC

BICC design, manufacture, and install complete busbar systems, including all conductors and supports. Illustrated above is part of the system supplied for the electro-tinning plant at the Ebbw Vale Works of Messrs. Richard Thomas & Baldwins Ltd. The total current carried approaches 50,000 amperes. The resources of BICC and its associated company, British Copper Refiners Ltd., for refining, rolling and extruding copper, are specially suited to the production of heavy current busbars.

Publication 304 tells you more about BICC busbars. Further technical advice is readily available from our specialist engineers.

BRITISH INSULATED CALLENDER'S CABLES LIMITED, 21 BLOOMSBURY ST., LONDON, W.C.1

TW TRANSFORMERS

FOR UNDERGROUND AND BASEMENT SUBSTATIONS

A 500kVA, 11kV, T.W. Distribution Transformer, Dry Type Air Cooled with All Silicone Impregnated Insulation

INSTAL

T.W. ALL SILICONE IMPREGNATED DRY-TYPE AIR-COOLED TRANSFORMERS

USING ONLY CLASS H INSULATION

NO FIRE RISK

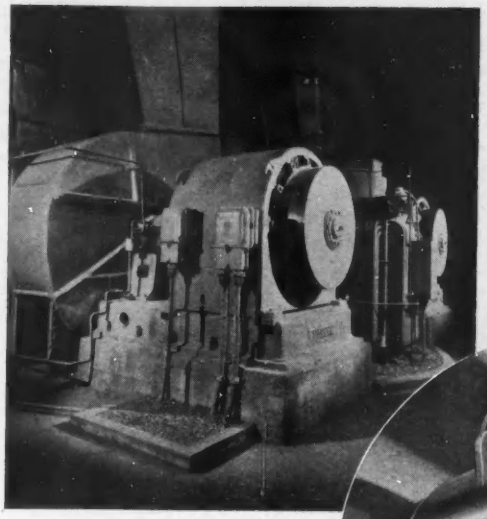
Special Features:—

1) Smaller in size and weight than O.N. units.
2) No fire risk.
3) Greater overload capacity.
4) Less maintenance.
5) Dust, humidity, and ventilation no problem.

Full details from:—

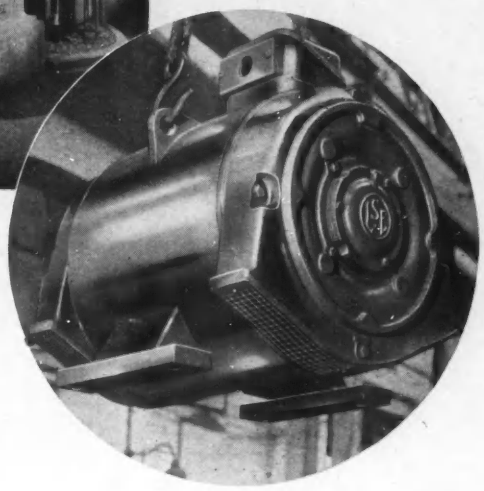
TRANSFORMERS (Watford) LIMITED

Sandown Road, Watford, Herts



"Square": Some of the thousands of L.S.E. motors serving British Electricity. These are N-S variable speed a.c. motors.

"Round": A standard L.S.E. screen-protected squirrel-cage motor.



Are your motor applications "round" or "square"?

For ordinary jobs L.S.E. make a very complete range of standard, but far from ordinary, motors—round pegs for round holes.

For many special requirements, too, L.S.E. can offer a machine, and the necessary control gear, exactly suited to its duty—and because L.S.E. have been making electric motors for more than seventy years, they are often able to say "We did a job just like that recently," even when the customer thinks he is posing quite a problem.

When electric motors are in question, L.S.E. are useful people to know.

LAURENCE, SCOTT & ELECTROMOTORS LIMITED

Specialist Makers of Electric Motors since 1883

NORWICH - MANCHESTER - LONDON AND BRANCHES

A

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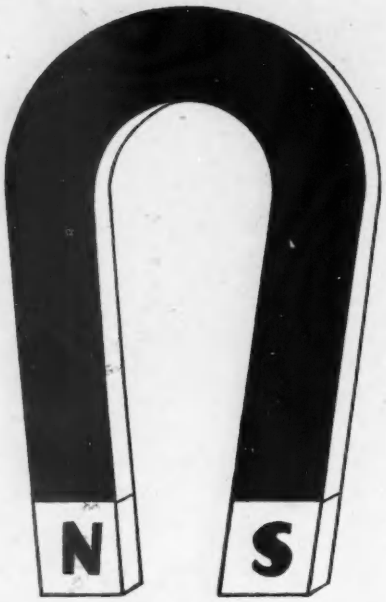

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"Staybrite" Steel

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NON-MAGNETIC

FIRTH-VICKERS STAINLESS STEELS LTD. SHEFFIELD

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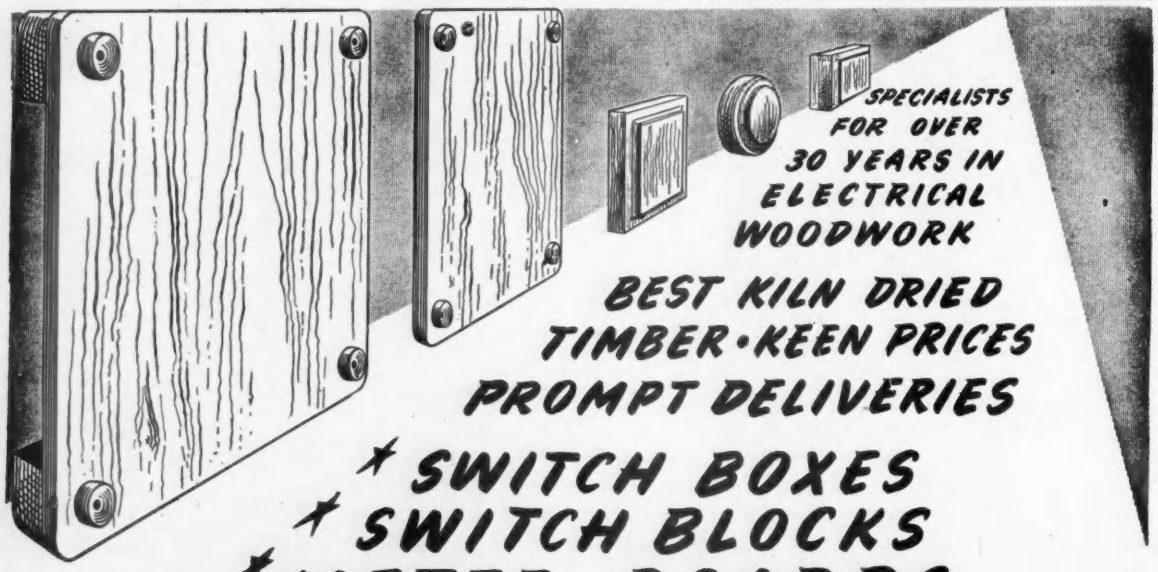

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BEST KILN DRIED TIMBER • KEEN PRICES

PROMPT DELIVERIES

★ SWITCH BOXES

★ SWITCH BLOCKS

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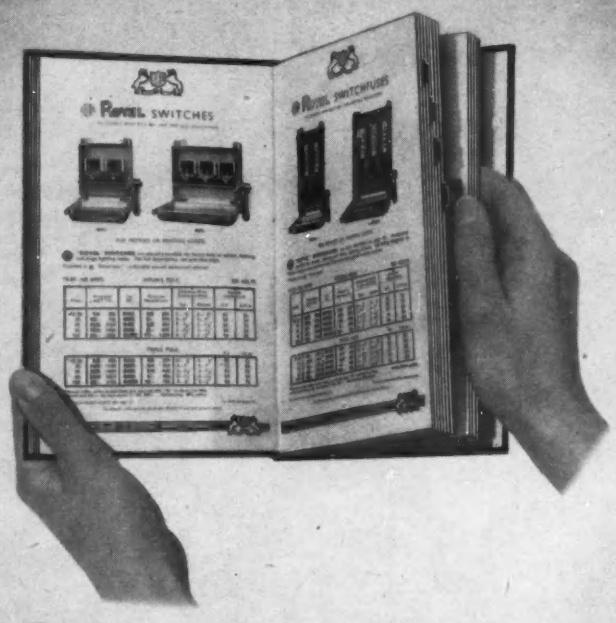
You cannot buy better gear



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ILLUSTRATES A COMPLETE RANGE OF
L.T. SWITCHES, SWITCHFUSES,
DISTRIBUTION BOARDS,
INDUSTRIAL PANELS, SWITCH-PLUGS AND SOCKET OUTLETS

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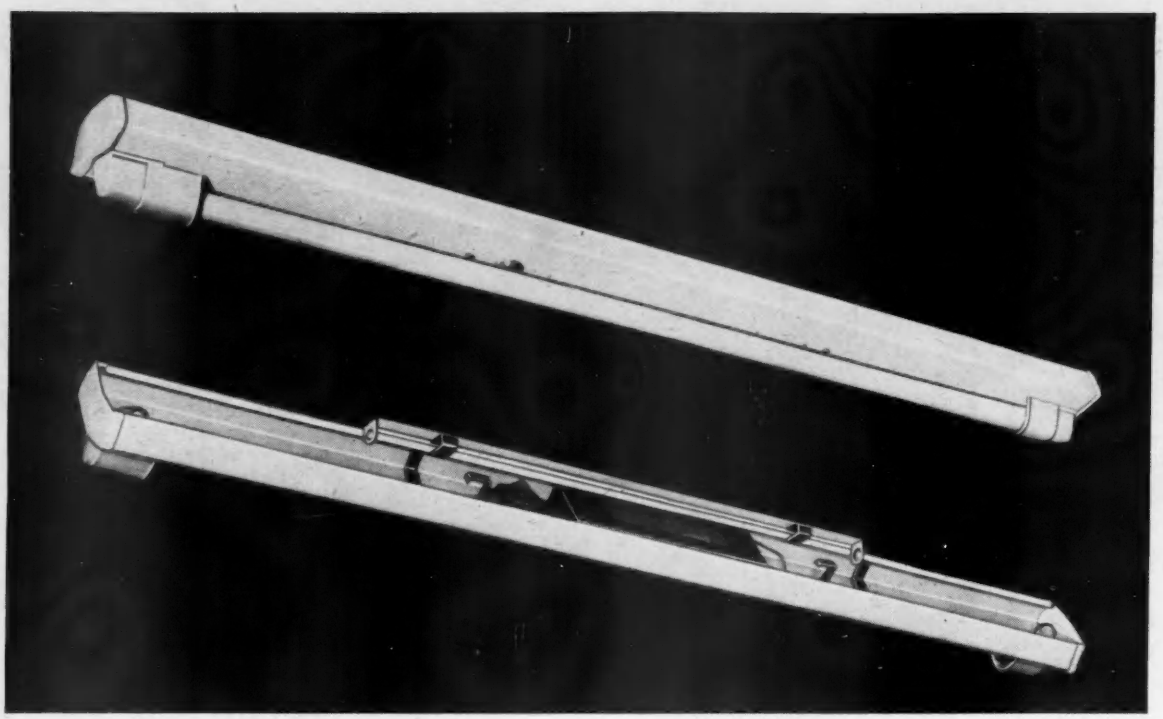


When it's a fitting occasion

When it's a question of installing attractive fluorescent lighting with the minimum of fuss and bother and cost, that's the time to turn to the *NEW* Crompton 'CEILINE' fitting (Fixing centres 24″). 'CEILINE' is a new design in the famous Crompton tradition for close ceiling fixing. It is finished in gleaming 'Permawhite' enamel for high glaze and hard wear and it is quickly and easily installed with positive earthing and earthing continuity to conduit or other wiring systems. Lamps are inserted or removed from either end and held in place by spring-loaded lampholders for sure contact and positive grip. Lamp end shields are adjustable and self-retaining and the quiet, clean control gear — either visible action switch-start or snap-start — accessible without the use of tools.

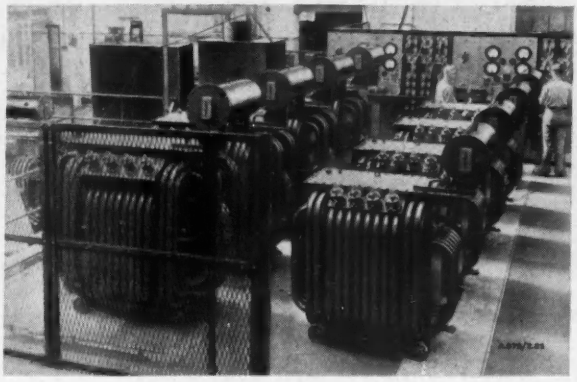
Yet, with all these advantages, 'CEILINE' is available at a very attractive price

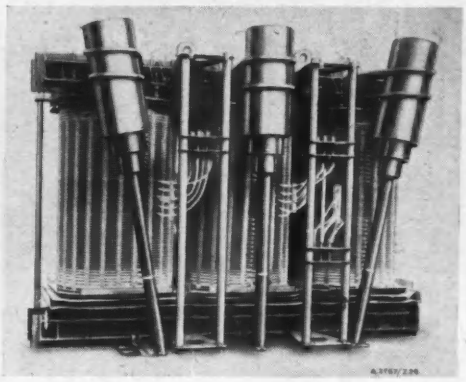
ELECTRICAL EQUIPMENT

Crompton 'CEILINE'

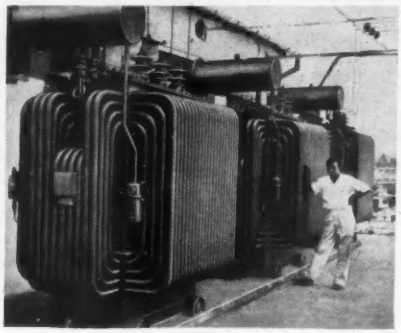
BY APPOINTMENT MANUFACTURERS OF ELECTRIC LAMPS TO THE LATE KING GEORGE VI

CROMPTON PARKINSON LTD · CROMPTON HOUSE · ALDWYCH · LONDON · W.C.2 · TEL: CHANCERY 3333





Specification Story



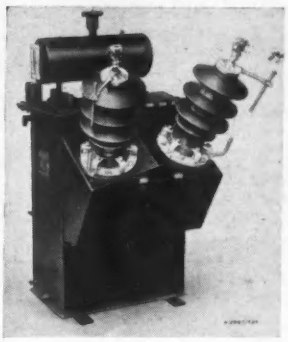
BRUSH TRANSFORMERS

1 *Eight 150 and 250 kVA transformers on test.*

2 *5,000 kVA transformer (Core & windings high voltage side) 3 phase, 50 cycles, 132/66/33 kV.*

3 *Three 1,250 kVA transformers installed at a paper mill in India, 3 phase, 50 cycles, 13,200/400 volts.*

4 *25 kVA pole mounting transformer single phase, 50 cycles, 33,000/240 volts.*



When every high-voltage transformer made today conforms to fixed standards of construction and performance, why do so many engineers prefer those made by BRUSH?

The answer is that British Standards and all other specifications are only a part of the story. BRUSH have their own special standards; rigid and exacting standards of design, workmanship, reliability and service after installation.

The result: BRUSH transformers offer a double guarantee during their whole life—which (as the BRUSH service department will tell you) can easily be 40 years or more.

Transformers by BRUSH

BRUSH ELECTRICAL ENGINEERING CO. LTD., LOUGHBOROUGH, ENGLAND

Branches at:—Birmingham · Bristol · Cardiff · Glasgow · Ipswich · Leeds · London · Manchester · Newcastle · Sheffield

B.24

MANY FAMOUS NAMES

Many famous names are included amongst the users of our patented cable trunking.

Babcock & Wilcox Limited.
Central Rediffusion Services Ltd.
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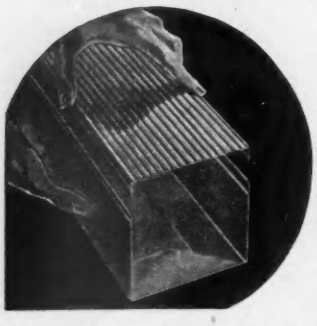
CHANNEL "Spring Capped" CONDUIT



If you would like to know about the many advantages of Channel Conduit please write or 'phone for descriptive pamphlet R.A.14.

Sizes stocked: 4 × 4, 4 × 3, 3 × 3, 3 × 2, 2 × 2, 2 × 1, 1 × 1, *and* 1 × ½.

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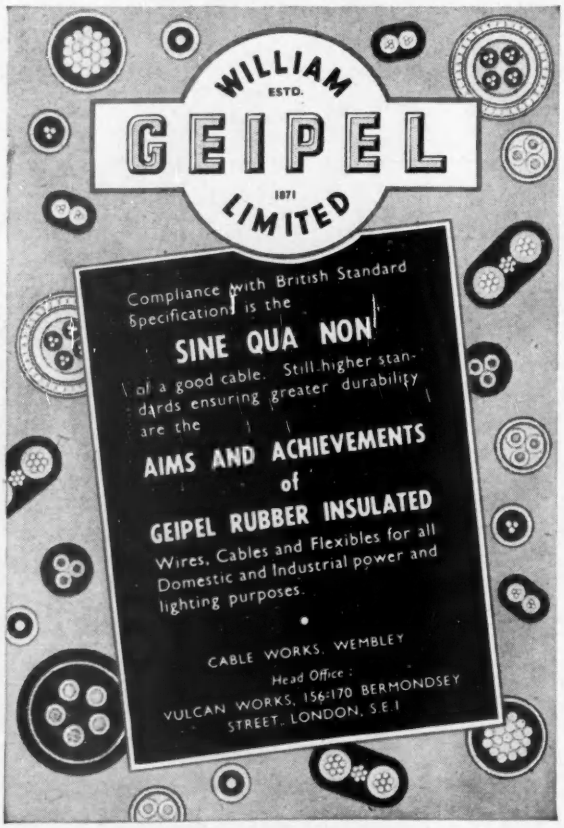
High resistance to oils, acids, moisture and corrosion. Provides a perfect insulating seal, even under extreme temperatures. Great dielectric strength (10,000 volts). Smooth plastic surface. High Elasticity. Ultra Endurance.
For all electrical insulating, sealing, binding, wrapping, identification etc. Available in 7 colours, in widths of ½ in. upwards. Heddo Tape is a product of the Heddon-Smith Group.

Manufacturers :

HEDDESCO Limited. HEDDONIA HOUSE, 374, EUSTON ROAD, LONDON, N.W.1
(A member of the HEDDON-SMITH Group of Companies)
Telephones: EUSton 8501 (6 lines)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1871
LIMITED
Compliance with British Standard Specification is the
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of a good cable. Still higher standards ensuring greater durability are the
AIMS AND ACHIEVEMENTS
of
GEIPEL RUBBER INSULATED
Wires, Cables and Flexibles for all Domestic and Industrial power and lighting purposes.
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This specialist service in NICKEL AND NICKEL ALLOYS

FURNACE ELEMENTS	Nickel alloys for long life at high temperatures; for certain special atmospheric conditions; for furnace constructional work.
DOMESTIC APPLIANCES	"Nichrome" V for long life at temperatures up to 1,150°C; "Nichrome" for temperatures up to 950°C; other alloys for less exacting conditions.
THERMO-COUPLES	"T1/T2" alloys (nickel-chromium and nickel-aluminium) for temperatures up to 1,100°C, are identical with the best-known wires formerly imported. Also Special "Advance" (nickel-copper) for use with copper or iron.
RADIO and TV FIELD	Cathode nickel, pure nickel and nickel-manganese, for sleeves, anodes, grids, filaments, supports, glass metal seals, etc.
LAMP INDUSTRY	Nickel-manganese for supports, grids, and lead wires; special alloys for a variety of efficient joints between metal and glass.
SPARK PLUGS	Alloys of the correct physical properties and temper to meet manufacturing requirements in centre and side electrodes; and such as special strip for stamping out multi-point discs for aircraft plugs.
FINE WIRES	Very fine wires from .002 in. downwards in various alloys, such as 80/20 Nickel Chrome, Pure Nickel, etc., for specialized applications.

BRITISH DRIVER-HARRIS CO. LTD

MANCHESTER 15

The greatest name in electrical resistance

"NICHROME" REGISTERED TRADE MARK

Fans for confined spaces

See how little space is occupied by this 5-stage Woods *Aerofoil* fan . . . how compactly it fits into the ducting. A two-stage contra-rotating fan can develop 7″ s.w.g. It is smaller than a comparable centrifugal, simpler to install, requires no bulky bends, no floor space, and consumes less current. High pressures are no longer the prerogative of the centrifugal fan; Woods multi-stage *Aerofoil* fans can develop 20″ s.w.g. or more. Woods fan engineer in your area will be happy to call. Write for publication V1089.

WOODS for Fans

WOODS OF COLCHESTER LIMITED, BRAISWICK WORKS, COLCHESTER

An associate company of The General Electric Company Ltd.

Technical Representative at :

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Cardiff: *Phone: 28055*
Glasgow: *Phone: Central 9250*
Leeds: *Phone: 32171*
Leicester: *Phone: Granby 721*
Liverpool: *Phone: Royal 7282*
London: *Phone: Chancery 5474*
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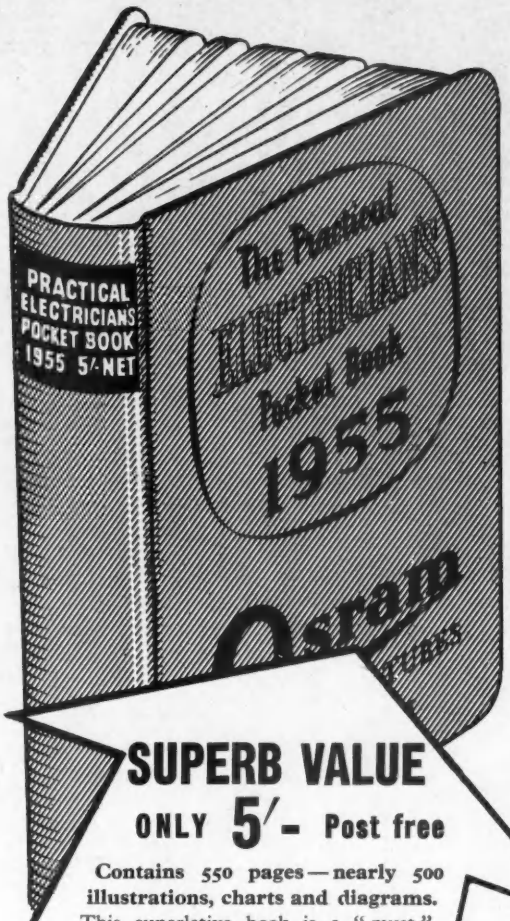
Essential TO EVERY ELECTRICIAN



THE PRACTICAL ELECTRICIAN'S POCKET BOOK

1955 *Edition*

NOW ON SALE

Packed with practical information—clearly arranged for quick reference—this is the BOOK OF THE YEAR for every working electrician and student. Every article right up to the minute with the latest ideas, tables and diagrams. In THE PRACTICAL ELECTRICIAN'S POCKET BOOK you'll find an answer to practically every job and problem you come up against.

Here are just a few of the many subjects covered by this invaluable book.

Universal motors, water heating, home lighting, illuminated signs, resistance wires, phase conversion, power factor correction, catering equipment, apprenticeships, electricity on the farm, servomechanisms, TV interference suppression, time switches, accumulators, alternating current motors, private generating plant, greenhouse heating, induction motors, refrigeration, lamps, lawn-mowers, leakage indicators, cooker maintenance, meters, portable electrical tools, wiring, flood-lighting, electronics in industry, lagging, ovens, oil circuit breakers, packet switches, rectifiers, measuring instruments, armature troubles and testing—**and a host of other vitally important articles giving you information necessary for success in your complicated trade.**

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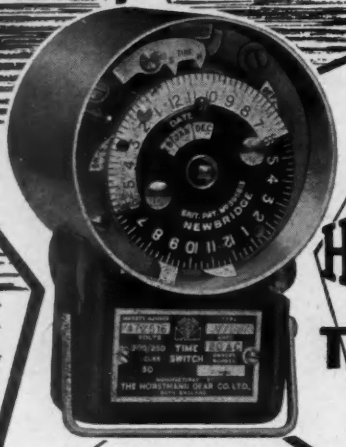
Contains 550 pages—nearly 500 illustrations, charts and diagrams.

This superlative book is a "must" for every electrician—and therefore is bound to sell out very rapidly. You must make sure of your own copy by ordering now. Order through your bookseller or direct from the Publishers, Odhams Press Ltd., ELECTRICAL AND RADIO TRADING, Dept. ET., Publishing Department, 6 Catherine Street, London, W.C.2, enclosing cheque or Postal Order for 5/- crossed /& Co./.

GET YOUR COPY NOW!

Stars of the lighting world



HORSTMANN TIME SWITCHES

Type "V"

The comprehensive range covers hand wound models (15, 21 & 40 day run), electrically wound models and synchronous models with or without spring reserve, as required. Models are available for public lighting, off peak tariff and shop window lighting control, etc., etc.

Many years of experience in the design and manufacture of automatic lighting appliances ensure that HORSTMANN TIME SWITCHES meet the exacting demands of modern lighting control.

The illustrations show the Type "V" 20 amp. and the Type "Y" 20 amp. switches. The latter is electrically wound and incorporates a spring reserve. Its compact size makes it particularly suitable for use in the base of lamp columns where space is limited.

Type "Y"

THE HORSTMANN GEAR CO. LTD.

NEWBRIDGE WORKS · BATH · ENGLAND TEL: 7241

There's always a call for

BARBOUR'S

FLAX LACING THREAD

for lacing switchboard cables

also

BINDING LINEN THREAD

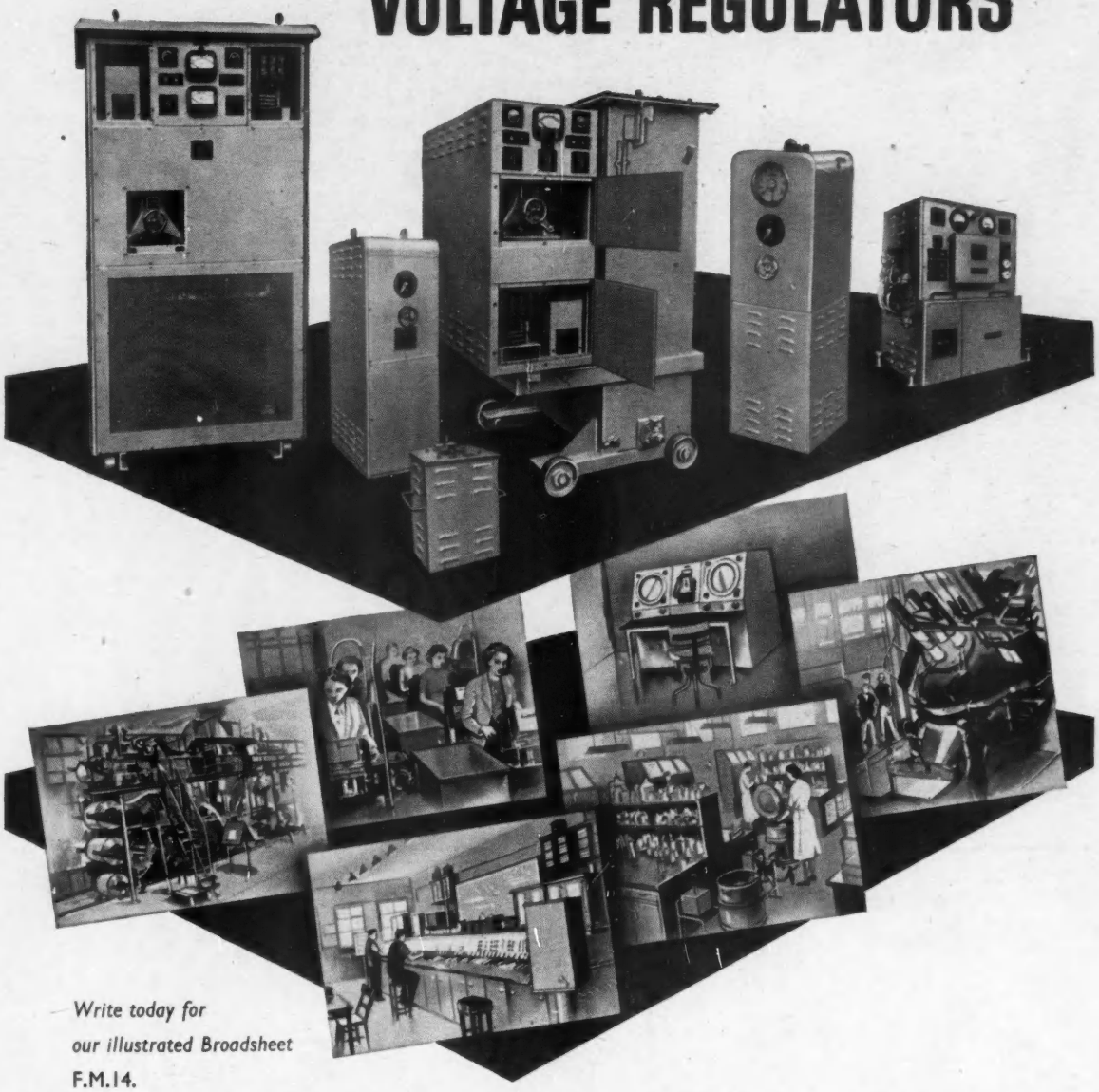
No. 30/3 Beeswaxed to P.O. Specification on 2oz. Cops.

WM. BARBOUR & SONS LTD. LISBURN N. IRELAND

On Top of every Industrial need...

FOSTER

VOLTAGE REGULATORS



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Specialists in Dependable Power Regulating Equipment

FOSTER TRANSFORMERS LTD · SOUTH WIMBLEDON · LONDON S.W.19

A 'LANCASHIRE DYNAMO HOLDINGS' COMPANY

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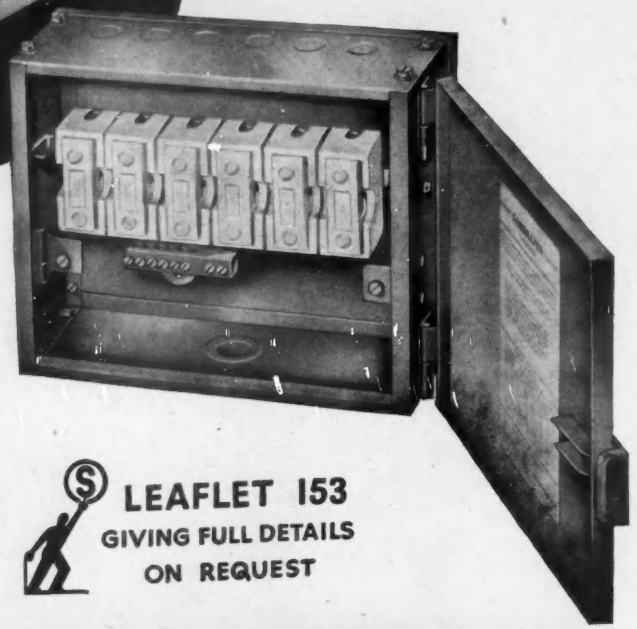
now

"SANDALITA"

250 VOLT SP & N FUSEBOARDS

. . . very inexpensively incorporating one of our long established and well tried fuses in a modern, light, sheet steel case.



A further item in the development programme of

SANDERS
WEDNESBURY

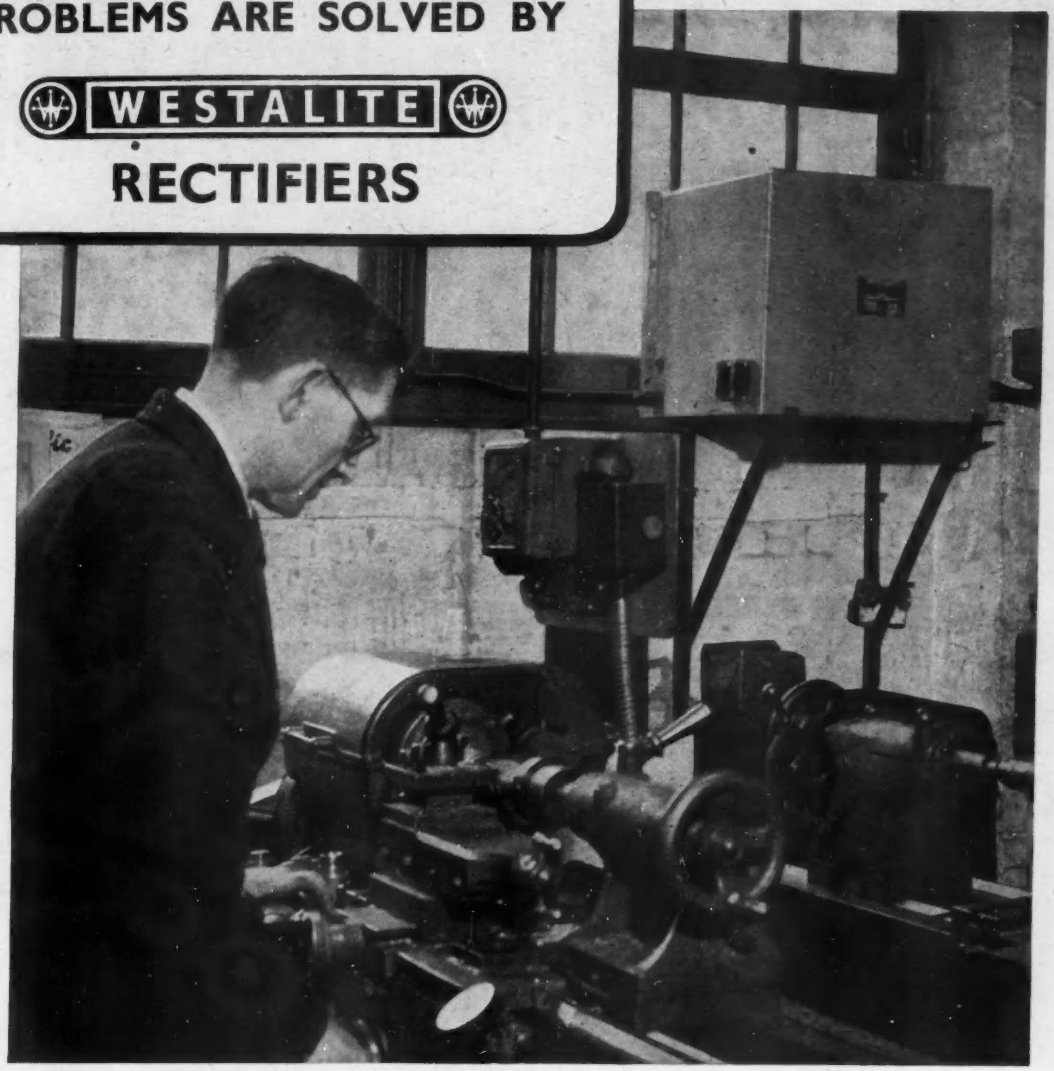
LEAFLET 153
GIVING FULL DETAILS ON REQUEST

WM. SANDERS & CO. (WEDNESBURY) LTD., WEDNESBURY, STAFFS.

DC/AC CHANGEOVER PROBLEMS ARE SOLVED BY

WESTALITE

RECTIFIERS



The illustration (by courtesy of Messrs. Self Engineering Co. Ltd.) shows a lathe powered by a D.C. motor operating from a "Westalite" rectifier, and is one of the many installations carried out by the London Electricity Board in the DC/AC changeover in the South East area of London.

By connecting a "Westalite" rectifier of the required output between the AC supply and the existing DC equipment, operations carry on as normal. It is as simple as that. Extensive ranges of single- or three-phase "Westalite" rectifiers for all industrial applications are available and are listed in Data Sheet No: 802. Write for a copy to the address below.

Dept. E.T.22

WESTINGHOUSE BRAKE & SIGNAL CO. LTD

82 York Way, King's Cross, London, N.1

They're lively lads at Lorival

Try plastics. Try Lorival.
Try the lively lads there. When they go to work, you get perfect design and service, keen prices and rapid delivery.
Their plastic and ebonite mouldings are beautifully finished, and your worries will be too.

This pack for "Easicut" twist drills was produced for English Steel Corporation Ltd., Openshaw, Manchester. The assembly is made up of three separate mouldings: the drill holder, the base and cover. The holder and base are compression moulded in phenolic material. The transparent cover is injection moulded in clear Polystyrene. A Phenolic cement is used to assemble the drill holder and base.

LORIVAL PLASTICS

UNITED EBONITE & LORIVAL LTD · LITTLE LEVER · NR. BOLTON · LANCS

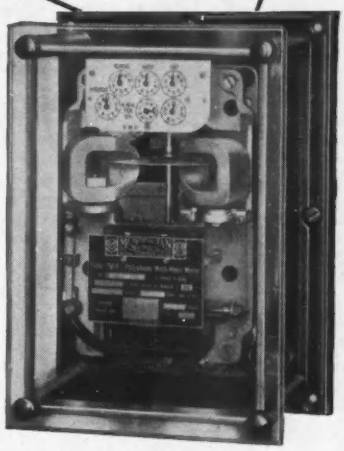
L38

Metrovick Metering Means Trouble-free Accounts

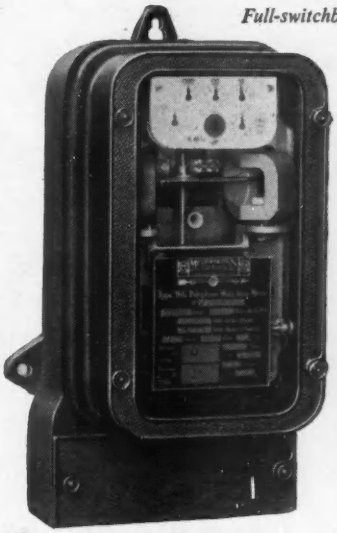
Type NE4 Three-element Polyphase Watt-hour Meters are designed to provide accurate performance up to one-and-a-half times full load.

- Accuracy not significantly affected by normal variations in voltage, frequency, wave form or temperature.
- 3 patterns—house-service, semi-switchboard and full-switchboard.
- Adjustments quickly and easily made.
- Fulfils requirements of BS 37.

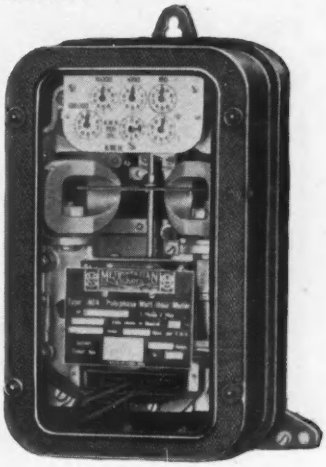
Type NE4 Maximum Demand and kVArh Meters also available



Full-switchboard Pattern



House-service Pattern



Semi-switchboard Pattern

TYPE NE4

POLYPHASE WATT-HOUR METER

for 3-phase 4-wire circuits up to 375 volts (phase to neutral). Self-contained up to 50 amps.

METROPOLITAN-VICKERS

ELECTRICAL CO LTD · TRAFFORD PARK · MANCHESTER, 17

Member of the AEI group of companies

for Meticulous Metering

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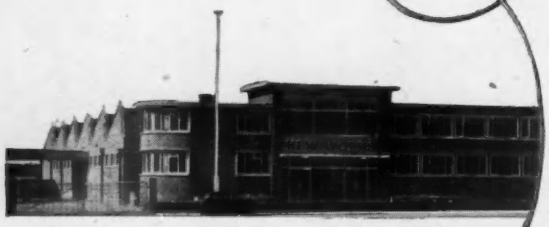
On our past

We build our future

FOR MANY YEARS we have served the needs of industry from our works at Kew... and we can look back on that period with a satisfaction that is justified by the many friends we have made. But the march of progress is inevitable... business commitments have grown, demands have increased. To meet these demands for our already comprehensive range of covered wires, we have built these modern premises at Bracknell.
Output will be increased, but our growth will not bring impersonality... we will retain the characteristics of the personally conducted business... on that we built our past... so will we build our future,



Kent Bros. Electric Wire Co.

& E.H. Phillips Limited

KEW WORKS, BRACKNELL
Berks. *phone: Bracknell 881 (4 lines)*
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K
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MODEL TS

A seven point winner:- smart appearance (with attractive stove enamel finish) - full size adjustable power wringer - power pump drainer - castors for easy movement - special Swirlux agitator - large capacity tub

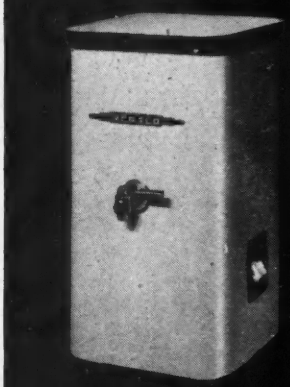
MODEL 500H

The perfect small washing machine:- heats the water - 6 lb capacity - 12 inch fold-down hand wringer - special Swirlux agitator (non-heated version Type 500 also available)

MODEL TS

500H

ROUND BOILER



SQUARE BOILER

VERSCO

ROUND BOILER

Obtainable in Galvanised finish as shown (a most durable finish of special appeal for Corporation and other housing schemes) or in cream stove enamel.

SQUARE BOILER

This smart and compact boiler is fitted with castors for easy movement and is finished in cream stove enamel. The table-top in cream vitreous is an attractive feature.

UNIVERSAL BOILERS & ENGINEERING CO. LTD.,

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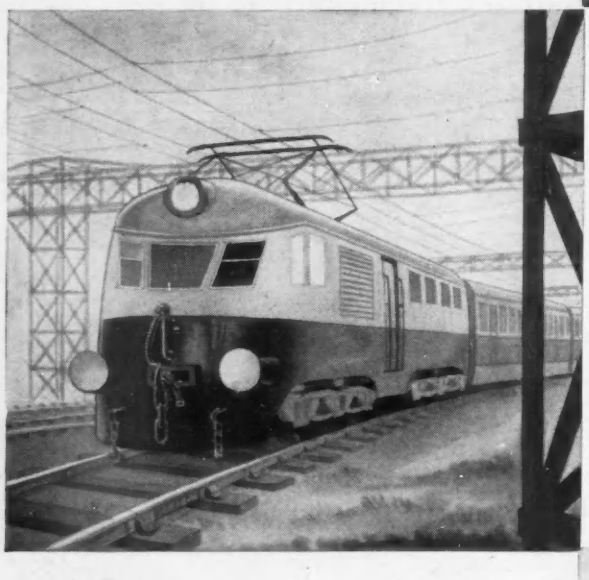
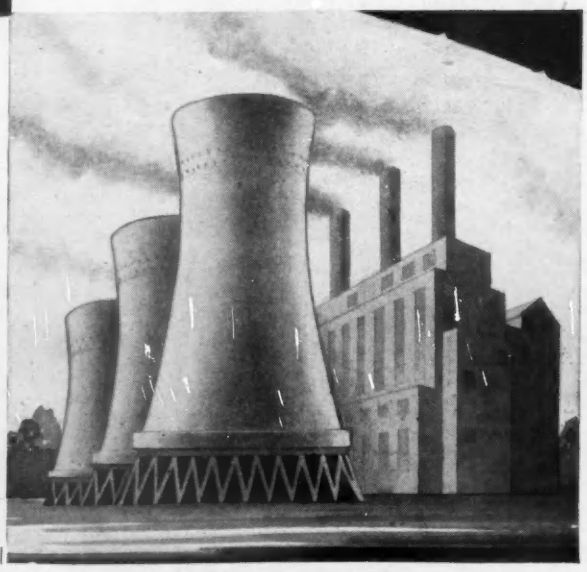
Current problems solved!



Behind the solution to "current" problems stand fifty-eight years of research and practical application in the field of cable construction. Well known to engineers for their superb performance and reliability, CONNOLLYS Paper Insulated Power Cables have "grown-up" with the mighty giant of Electric Power. Many Area Electricity Boards, Collieries and Railways rely on the safe enduring qualities of CONNOLLYS Cables knowing that in our modern factory we, ourselves, carry through every stage of manufacture from wire-drawing, to final testing. CONNOLLYS Paper Insulated Power Cables are produced to British Standards and other specifications from 660 to 11,000 volts. Special finishes can be manufactured to customers own requirements.

Founder members of the C.M.A.



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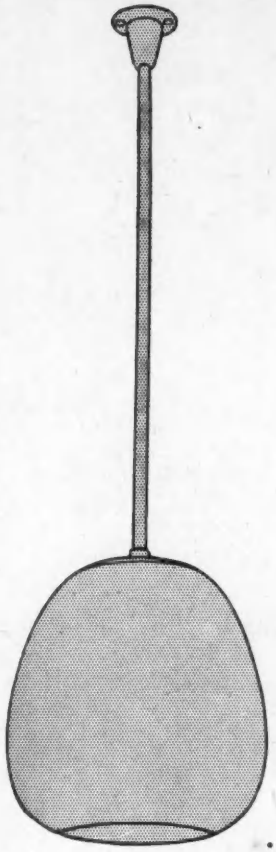
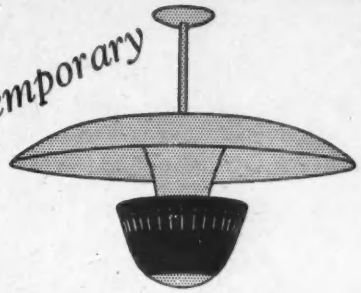
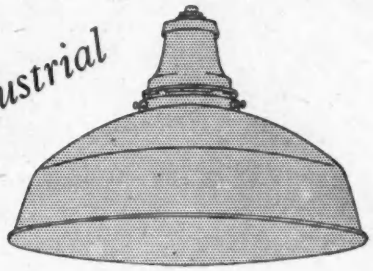


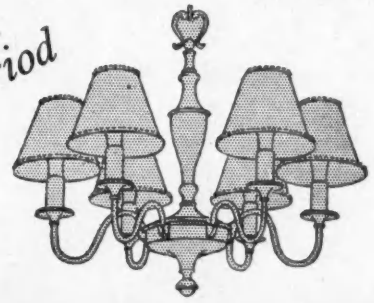
Commercial



Contemporary



Industrial



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"ELEGANCE WITH EFFICIENCY"

500 V UP TO 300 A AC OR DC

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. . . Berco Toroidal Wound Power Rheostats to suit every specification. Made in 5 sizes and of rugged construction to combine highest mechanical strength with maximum electrical performance, Bercostats are, if required, supplied with:—

✱ **'Off' positions at either end of the winding.**

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All models are vitreous enamel bonded and can be supplied with standard pressed steel covers for front of board mounting. Multi-gauged units with any combination of ohmic values are also available.

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Pioneers of the toroidally wound power rheostat in England

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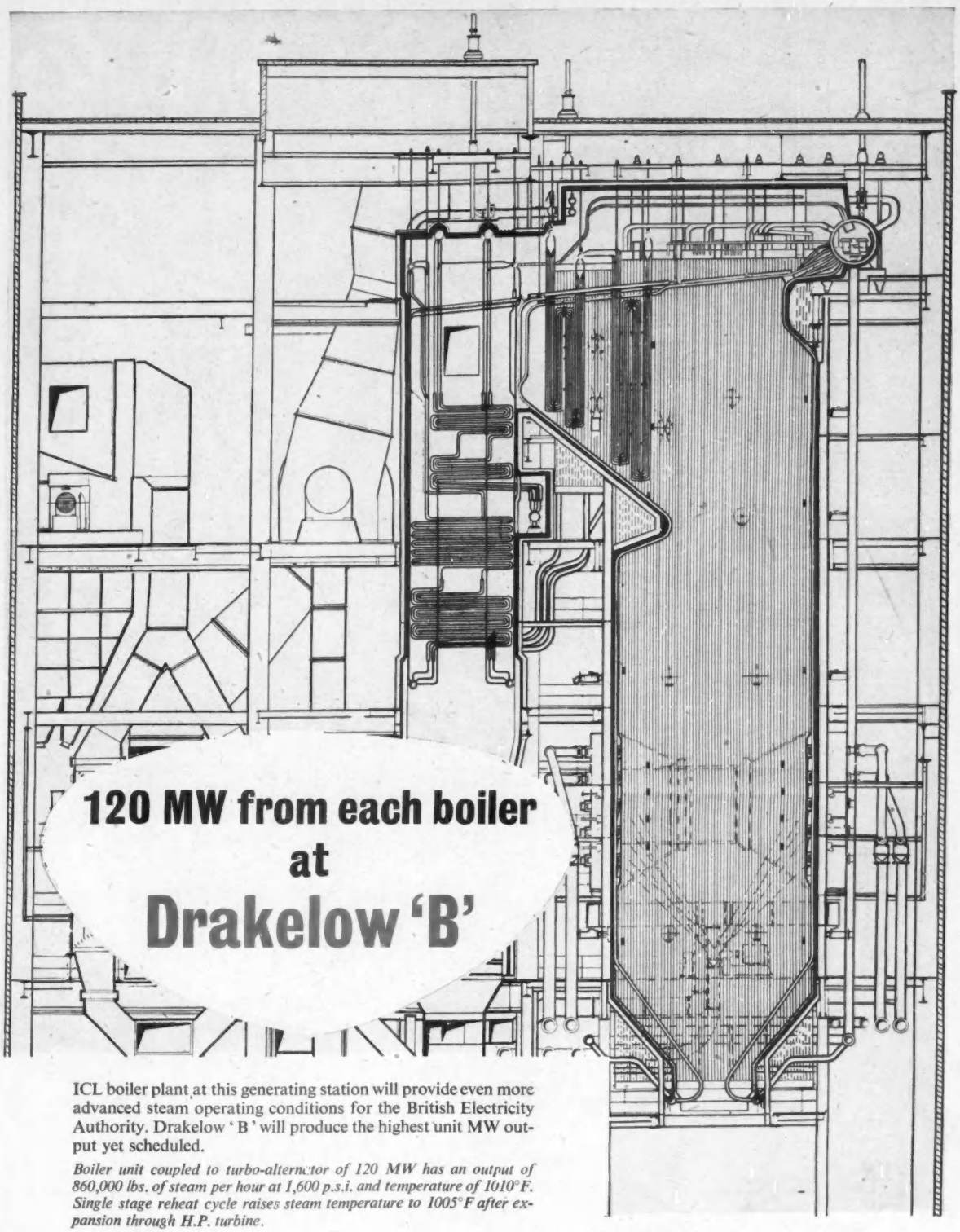

120 MW from each boiler at Drakelow 'B'

ICL boiler plant at this generating station will provide even more advanced steam operating conditions for the British Electricity Authority. Drakelow 'B' will produce the highest unit MW output yet scheduled.

Boiler unit coupled to turbo-alternator of 120 MW has an output of 860,000 lbs. of steam per hour at 1,600 p.s.i. and temperature of 1010°F. Single stage reheat cycle raises steam temperature to 1005°F after expansion through H.P. turbine.

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SG.44

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HERE ARE A FEW MORE of the MANY ADVANTAGES offered by the ***SenTerCet*** *D.C. Cable Testing Equipment:*

★ **Provides a highly sensitive check on the presence of moisture in cables, joints and terminations.**

★ **A few milliamps of D.C. can break down an incipient fault without appreciably affecting the cable other than along the path of discharge.**

★ **Whilst the effect of an A.C. test depends fairly critically upon the time element, D.C., on the other hand, will usually fail a weak cable, or induce signs of failure, within five minutes.**

Bulletin F/CT.1. contains full details of both transportable and trailer-mounted equipments.

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Registered Trade Mark

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Keepalite FOR BANKS

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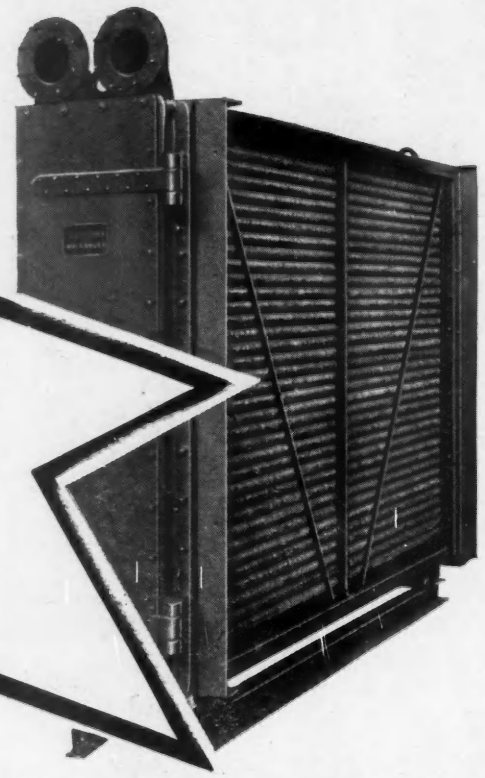
CLOSED CIRCUIT AIR AND HYDROGEN COOLERS



THE PREMIER COOLER & ENGINEERING CO., LTD., SHALFORD, near GUILDFORD, SURREY

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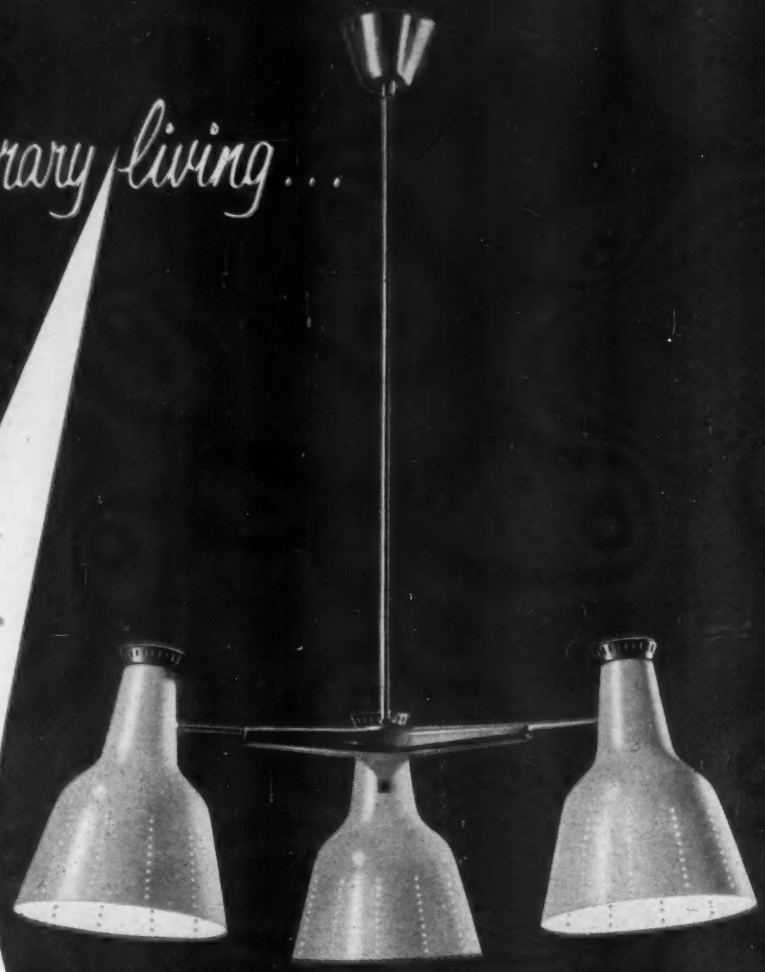

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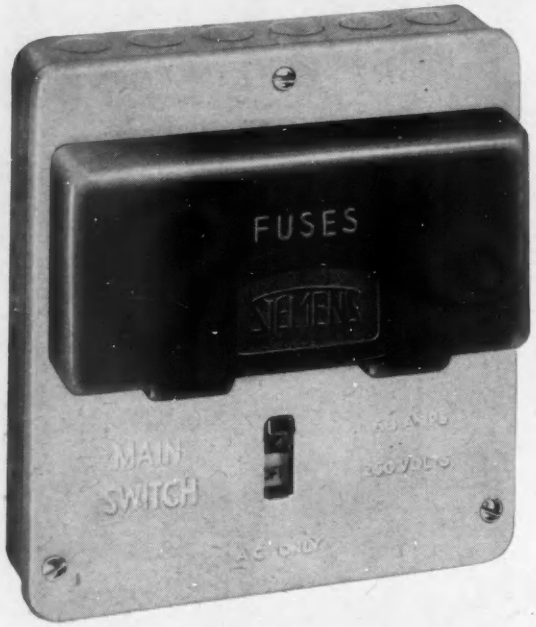
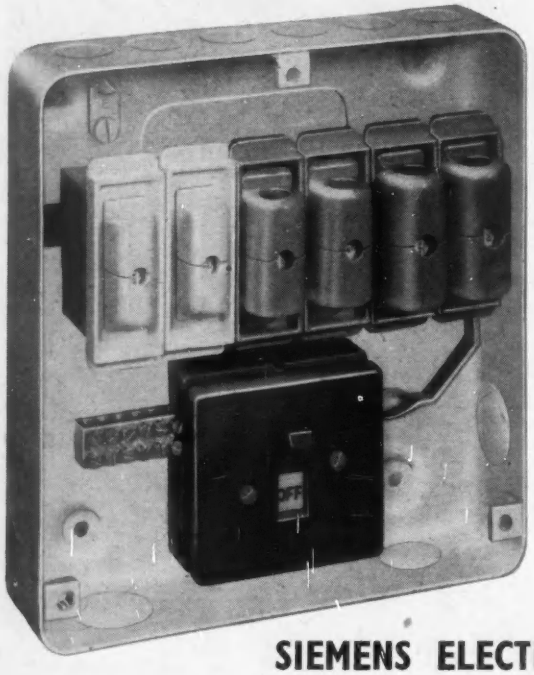
SIEMENS 'NEWTYPE'

Consumer Service Unit





METALCLAD AND INSULATED PATTERNS
4-WAY, 5-WAY AND 6-WAY

These consumer units are a scaled-down version of our popular F 3081 8-way units. Every consideration has been given to provide ample wiring space and easy wiring facilities. Unnecessary refinements have been eliminated with a view to providing a high quality efficient consumer unit as low in price as any on the market.

The units are fitted with fuse bases which will accommodate either H.R.C. Cartridge Fuse Carriers or Rewireable type Carriers as required.

CATALOGUE NUMBERS AND PRICES				
NO. OF WAYS	METALCLAD	INSULATED	LIST PRICE WITH H.R.C. FUSES	LIST PRICE WITH REWIREABLE FUSES
			£ s. d.	£ s. d.
4 ways	F 3295/M4	F 3295/B4	3 3 0	2 19 8
5 ways	F 3295/M5	F 3295/B5	3 5 0	3 0 10
6 ways	F 3295/M6	F 3295/B6	3 7 0	3 2 0

DIMENSIONS: Metalclad Height 7⅛" Width 6⅞" Depth 3⅛"
Insulated Height 7⅞" Width 7½" Depth 3¼"

SAFE · FOOLPROOF

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Illustrated leaflet No. 107/54 will gladly be sent on request.

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ANOTHER H.T. SWITCHBOARD

Typical 11kV 250 MVA IVI switchboard embodying arc trapped circuit breakers for important industrial substation.

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Also supplied for outdoor use

YORKSHIRE SWITCHGEAR

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LEEDS ——————— LONDON

Associated with Electro Mechanical Mfg. Co. Ltd., Scarborough

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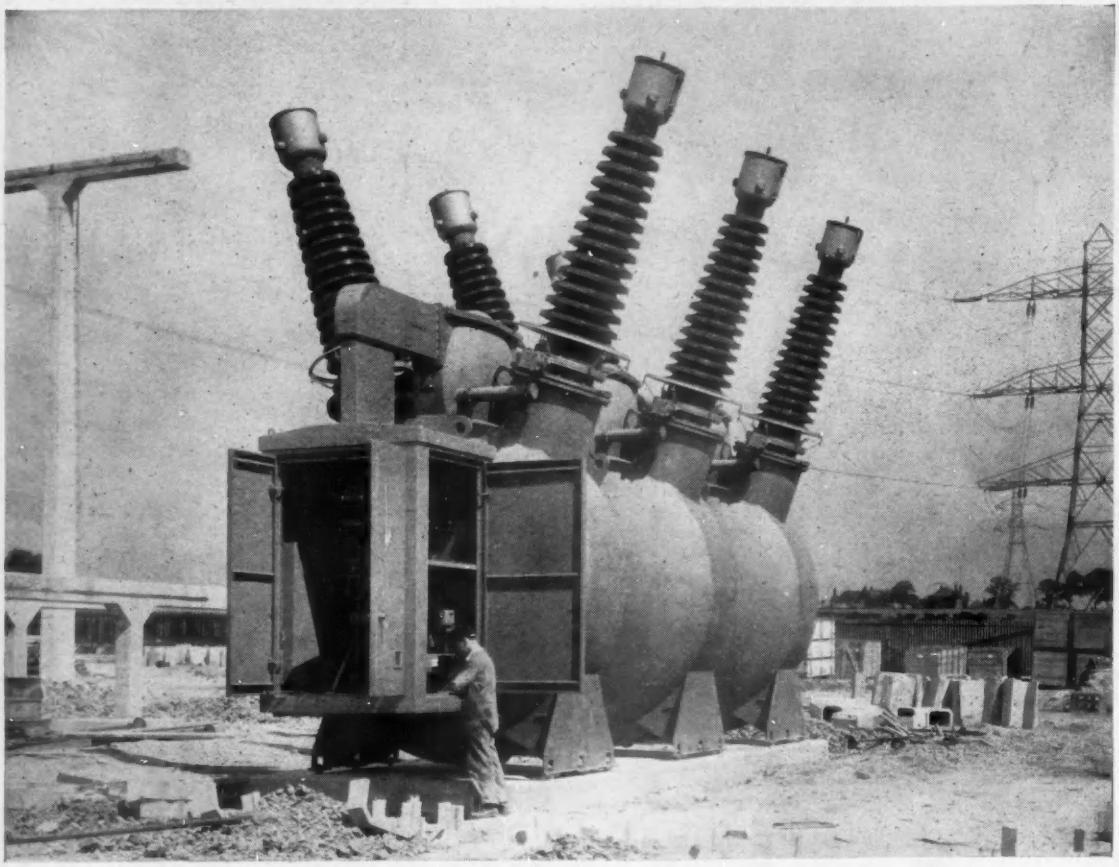
275 kV, 7500 MVA Shuntarc Oil Circuit Breakers
For the **B.E.A. Super Grid**



The illustration shows erection in progress at West Melton Substation

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THE BRITISH THOMSON-HOUSTON CO., LTD., RUGBY, ENGLAND

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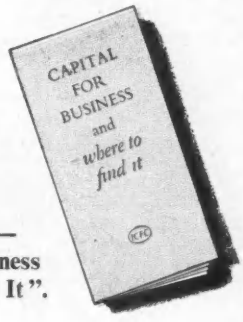
This firm specialises in the manufacture of high-vacuum equipment. ICFC began a series of investments in 1946, when the business was operating in premises such as those shown in the upper photograph. Today the firm is installed in this fine modern factory of 100,000 sq. ft.

ICFC capital has changed the picture for many industrial organisations by financing new buildings, new plant and schemes of general expansion. The Corporation provides finance in the form of long-term loans on fixed terms, or share capital, to industrial and commercial enterprises in Great Britain. Amounts range normally between £5,000 and £200,000. Formed in 1945 by the English and Scottish banks, ICFC has already aided the expansion of British industry by loans totalling over £40,000,000.



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ICFC

P.3

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Birmal supply aluminium and magnesium castings in the sand, gravity die and pressure die process, and zinc pressure die castings.

You get more than a casting from BIRMAL

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one eighth horse power

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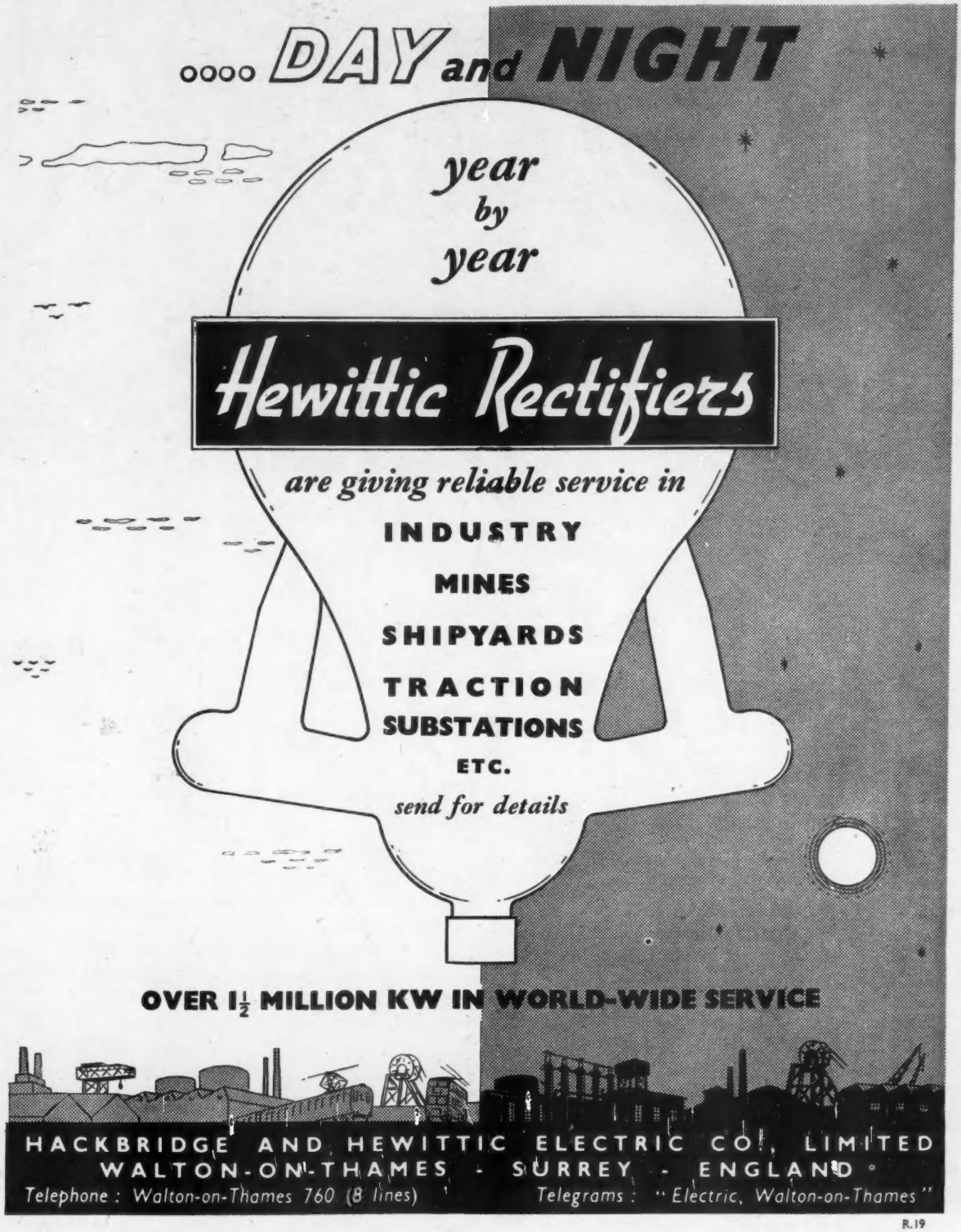
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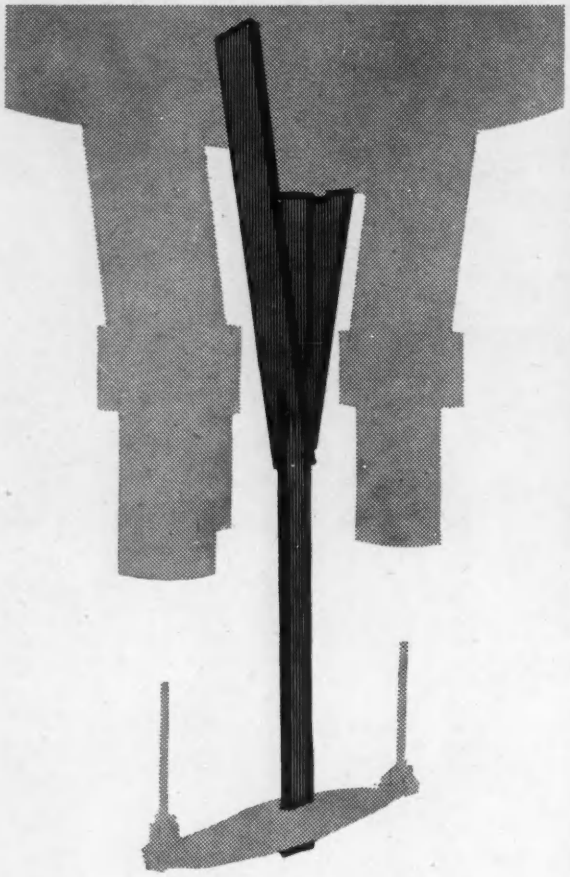

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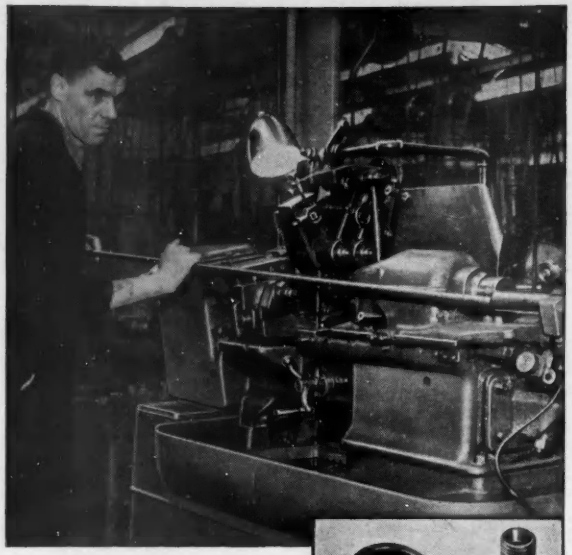

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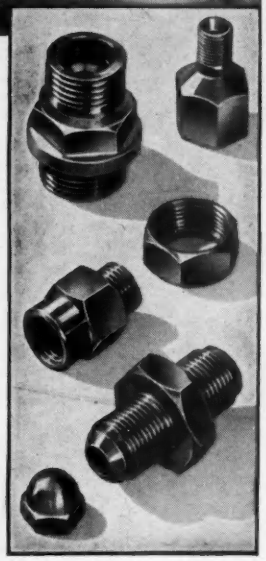

No. 4 Turning and Screwing Brass Rods

Ever higher speeds demand ever greater precision—and British industry needs both if production is to be increased and costs reduced. McKechnie Brothers have developed a range of standard high-speed turning and screwing rods, including the popular **No. 4** and **YS,** all of which are guaranteed to combine the correct alloy and temper for maximum machine speeds and longest tool life. For full details of these and other MKB free machining rods please write to—

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(Aluminium Conductor, Aluminium Sheath)

IN 1948 J. & P. pioneered the introduction of aluminium sheathed cables with copper conductors and developed economic manufacturing processes.

Since that time they have carried out a considerable amount of research into the use of aluminium as a conductor material to enable them to offer to purchasers an all aluminium cable.

It is worth mentioning that prior to the development of the aluminium sheath the practical and economic advantages to be derived from the use of aluminium as a conductor material were negligible.

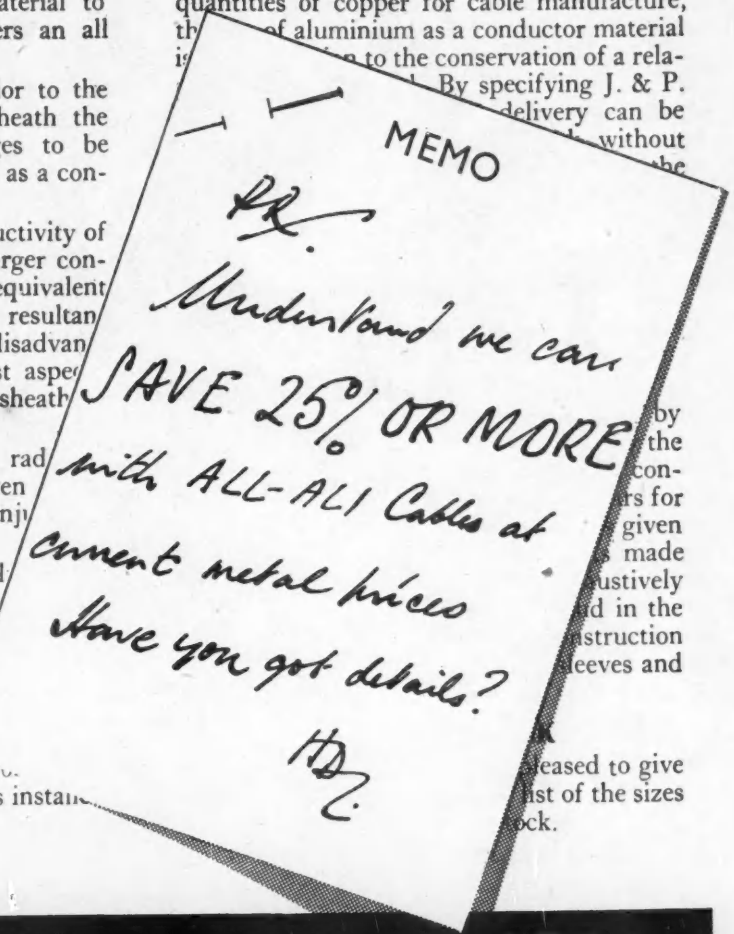
As is well known the lower conductivity of aluminium requires the use of a larger conductor than with copper for an equivalent current carrying capacity. The resultan increase in diameter was a serious disadvan age from both the weight and cost aspe when lead was the only available sheath material.

The situation is, however, rad changed when consideration is given use of an aluminium sheath in conju with aluminium conductors.

Despite its larger size, an all al cable may be as little as one thi weight of the equivalent copper lead sheathed, single wire armo Obviously the reduced weight is able advantage in all above gr lations — besides facilitating transport for any type of installatio it is of special importance for cables instal in mine shafts and on ships.

Further, the aluminium conductor and aluminium sheathed cable shows in many sizes a useful price advantage over alternative types of cable.

At present, when there is some uncertainty as to the continuing availability of adequate quantities of copper for cable manufacture, th of aluminium as a conductor material i to the conservation of a rela- By specifying J. & P. delivery can be without the



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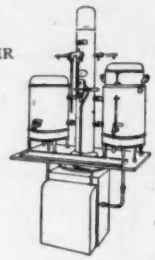

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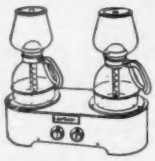

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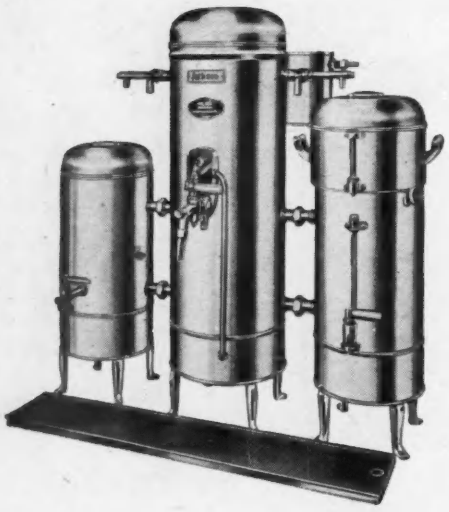

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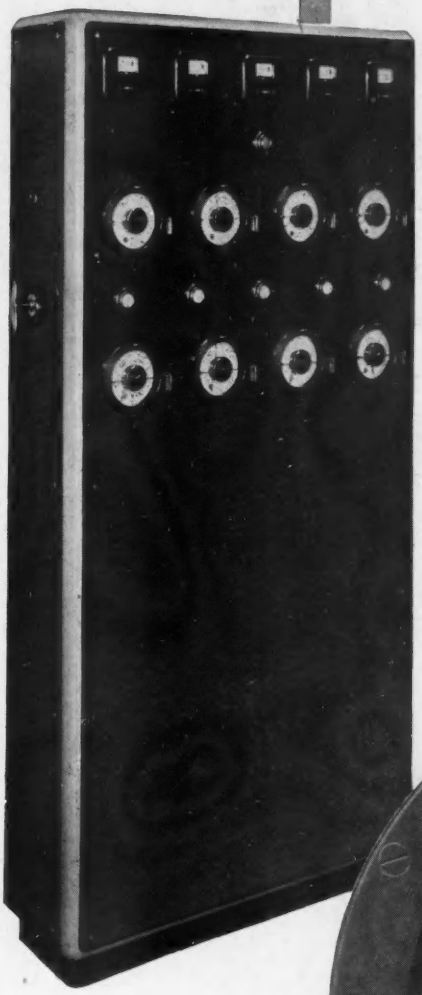

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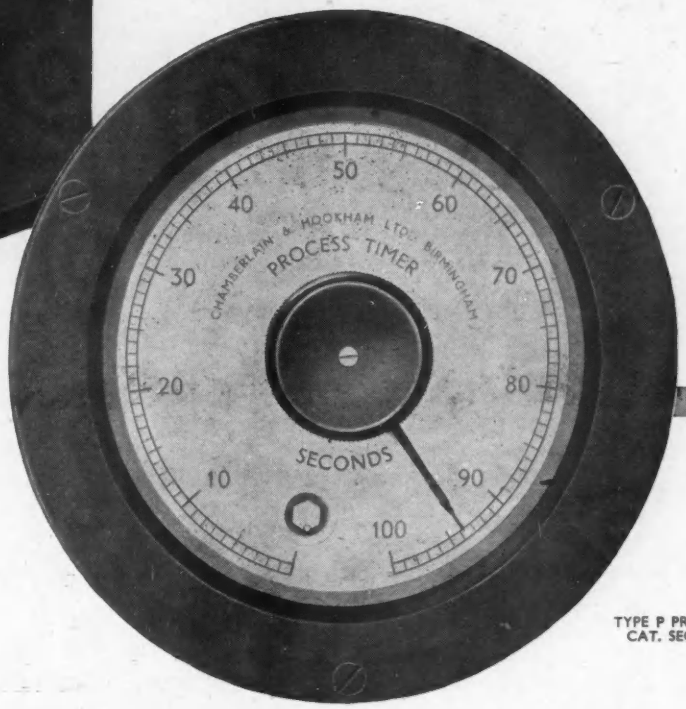

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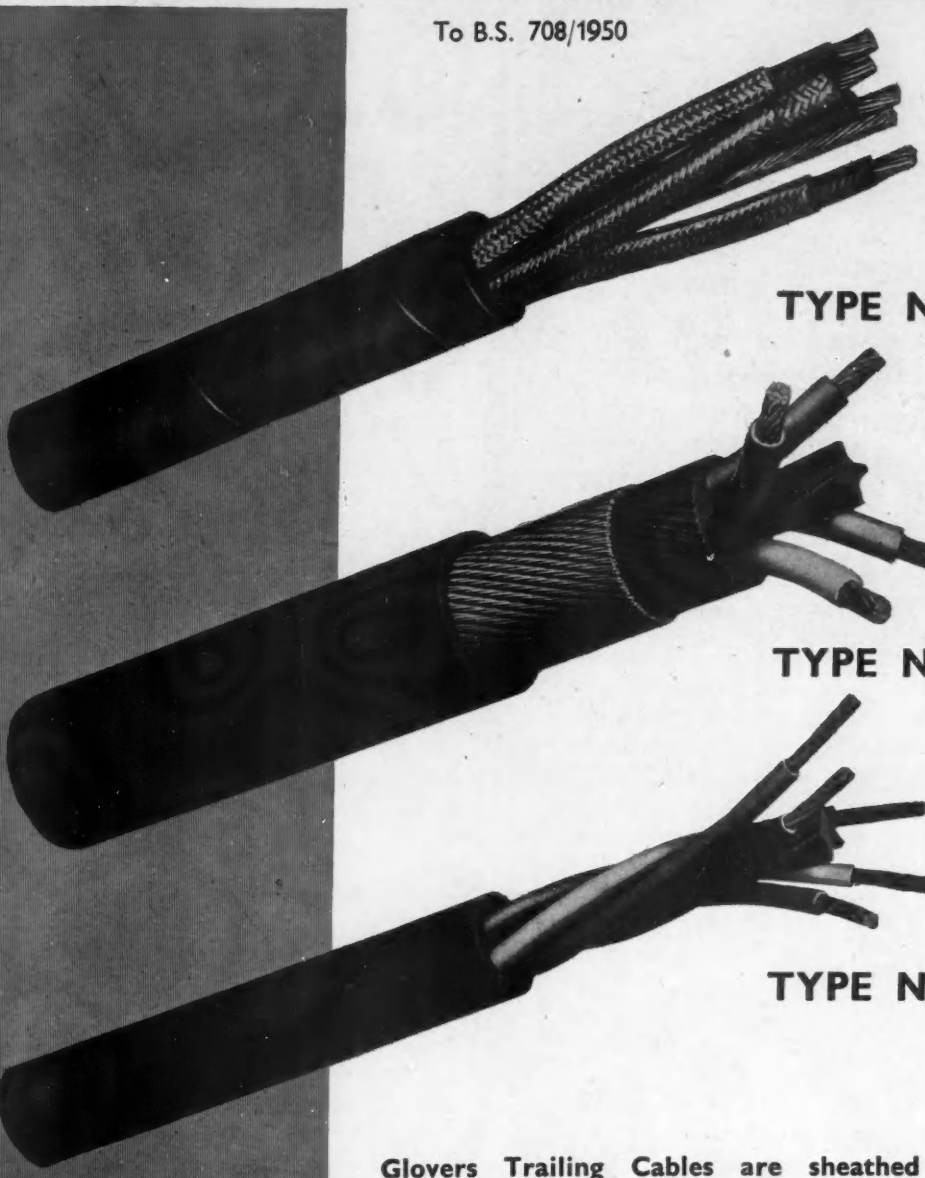

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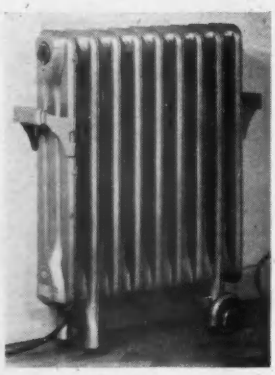

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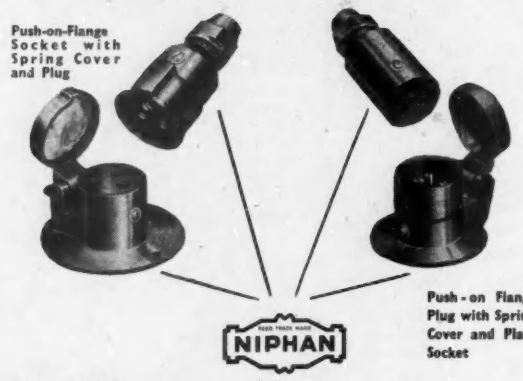

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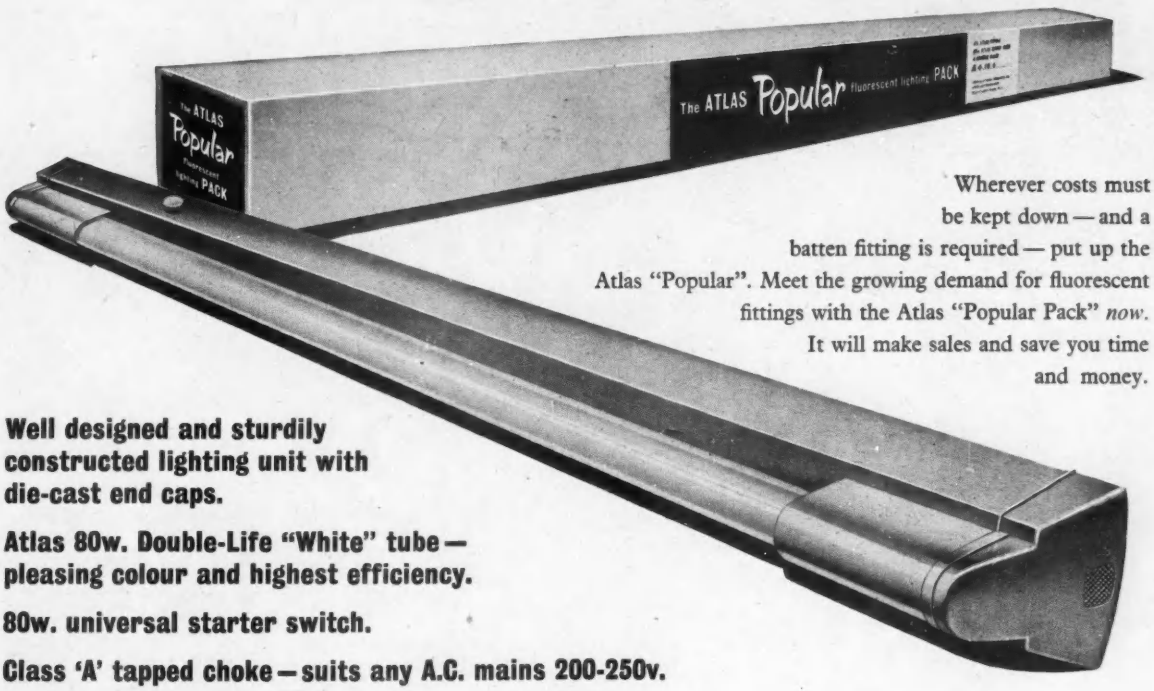

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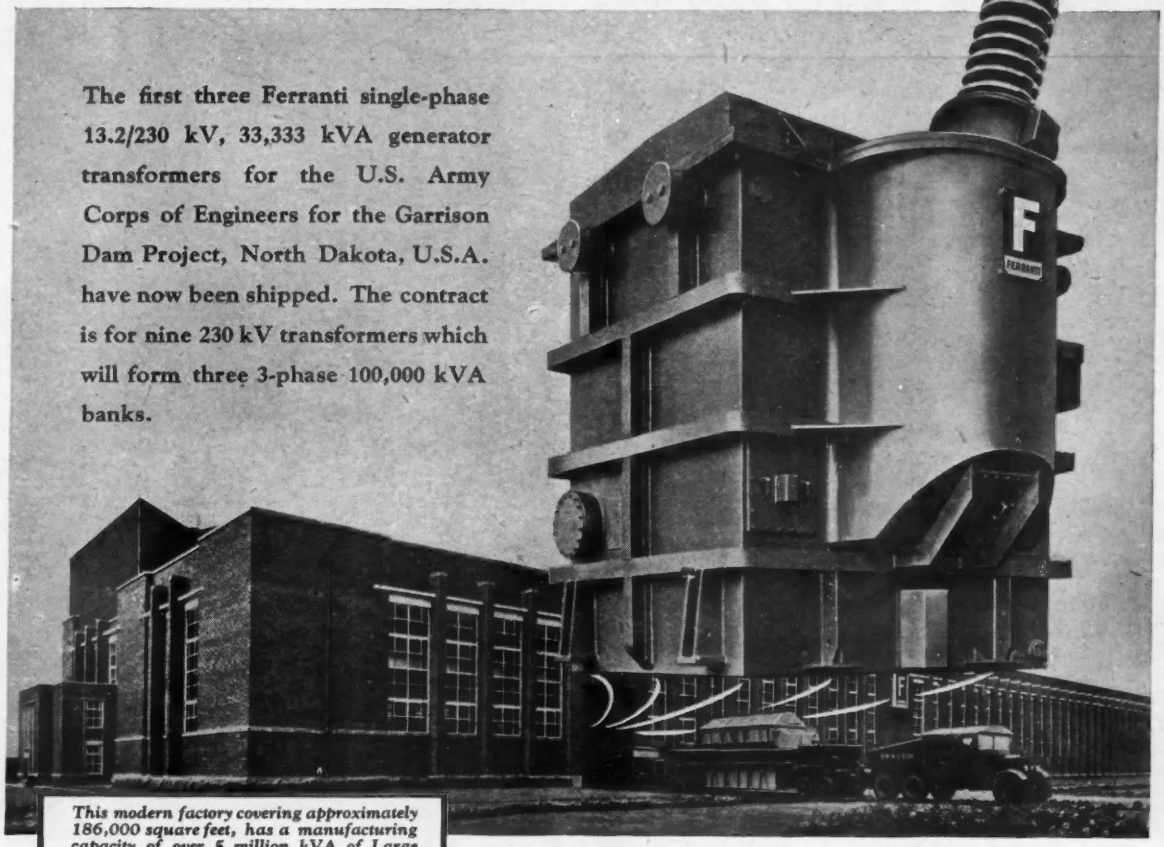

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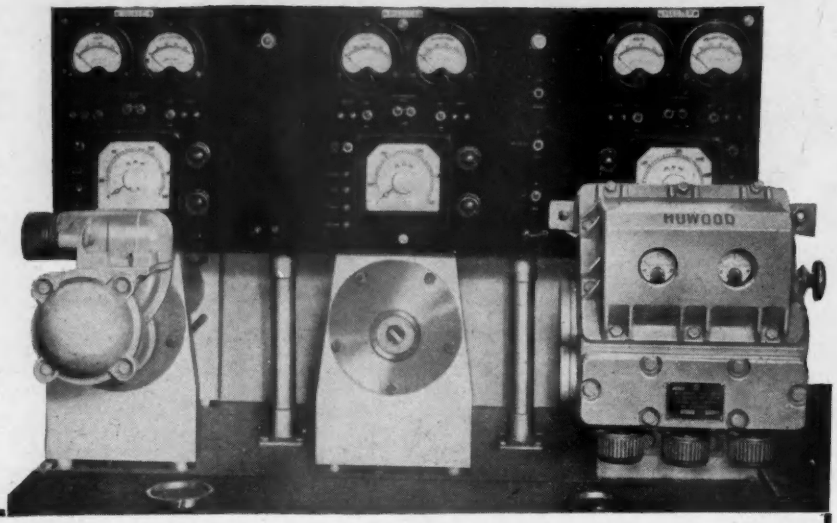

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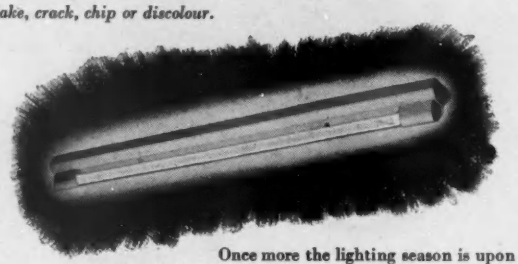

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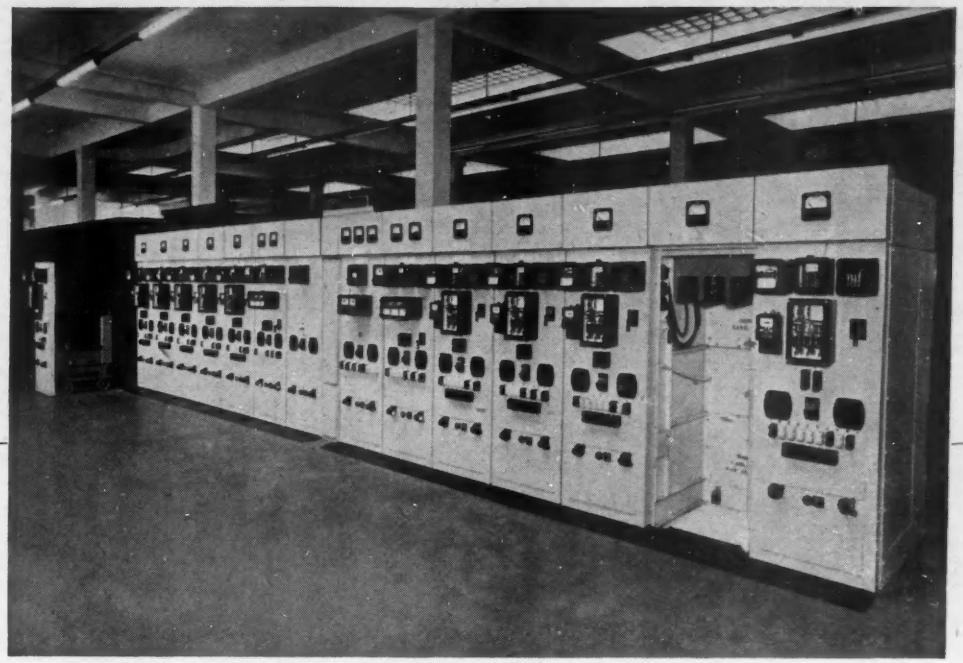

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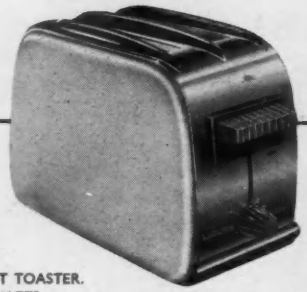

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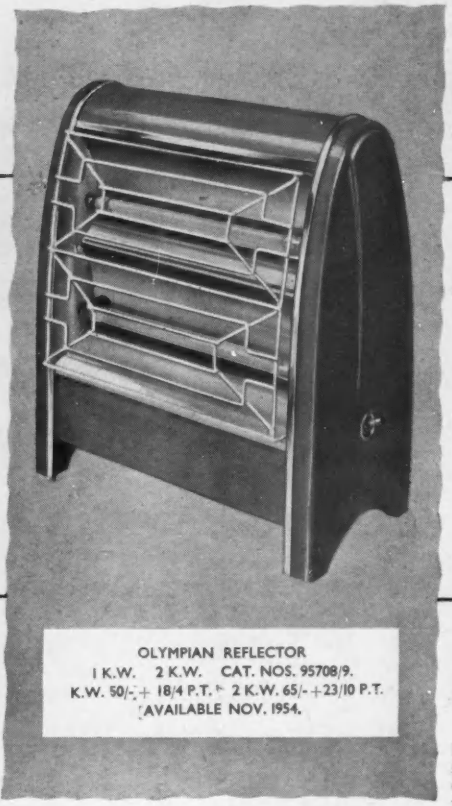

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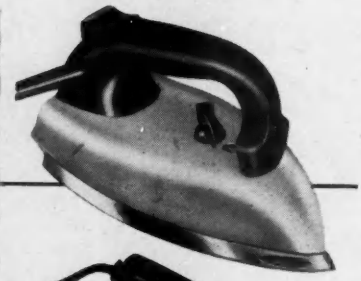

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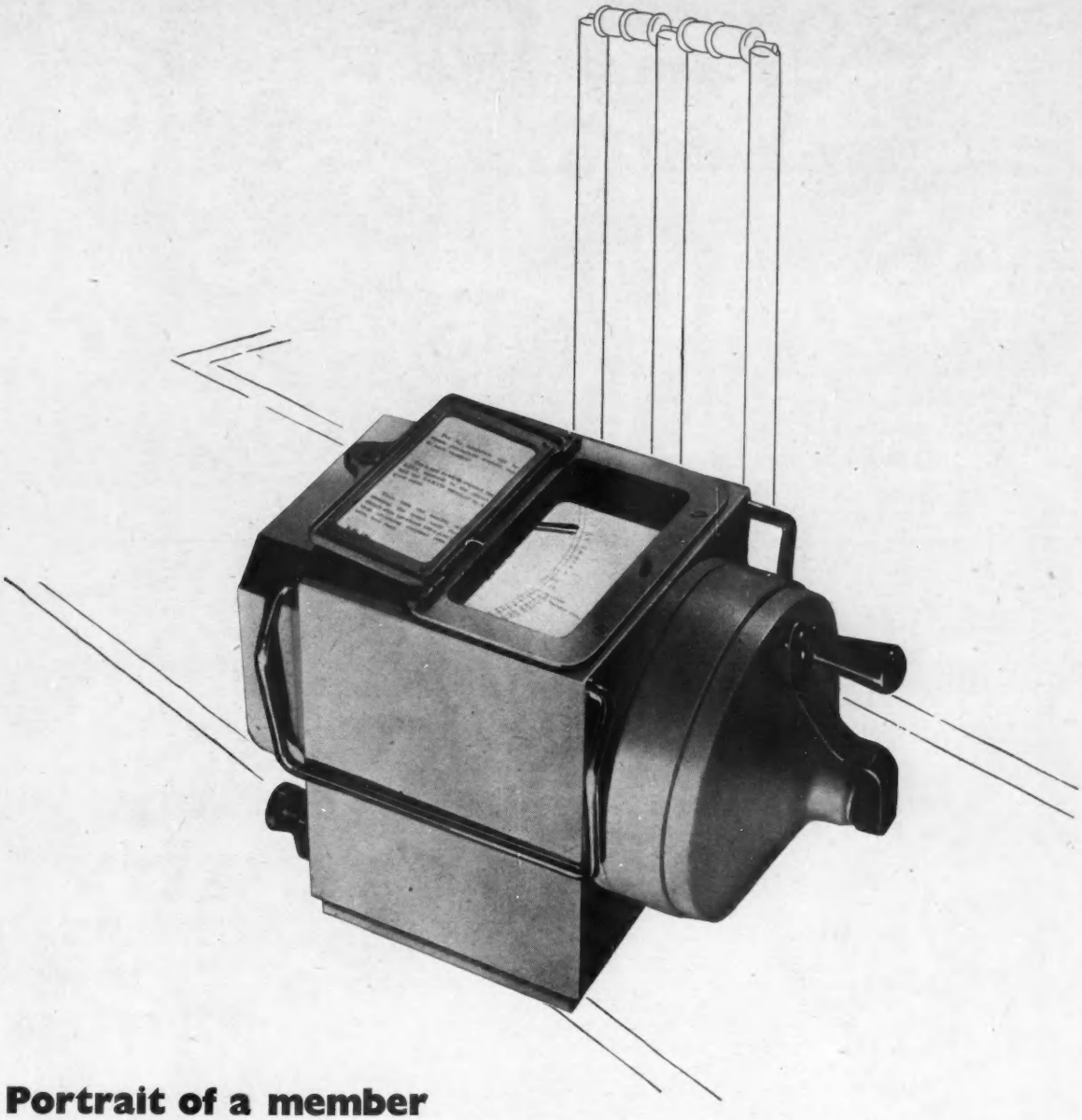

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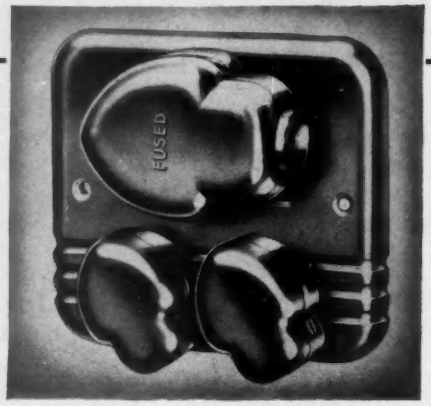

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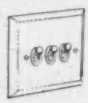
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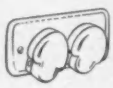
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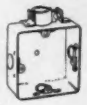
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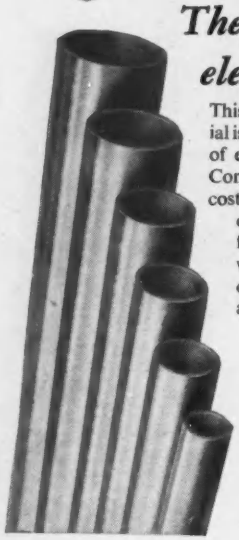

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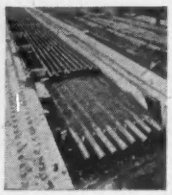

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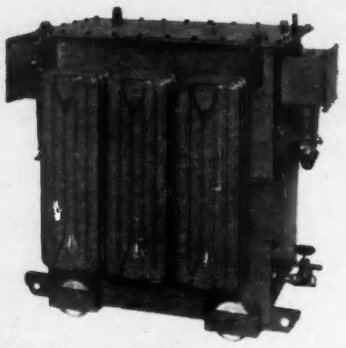

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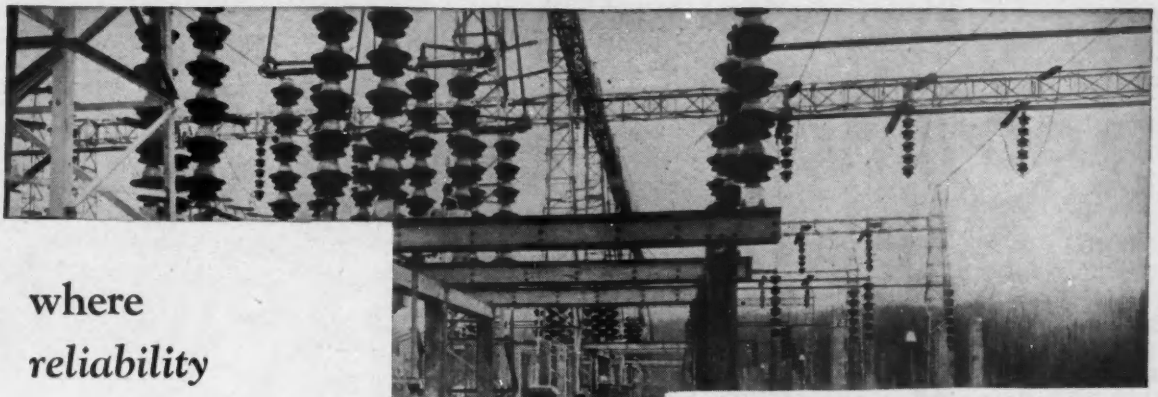

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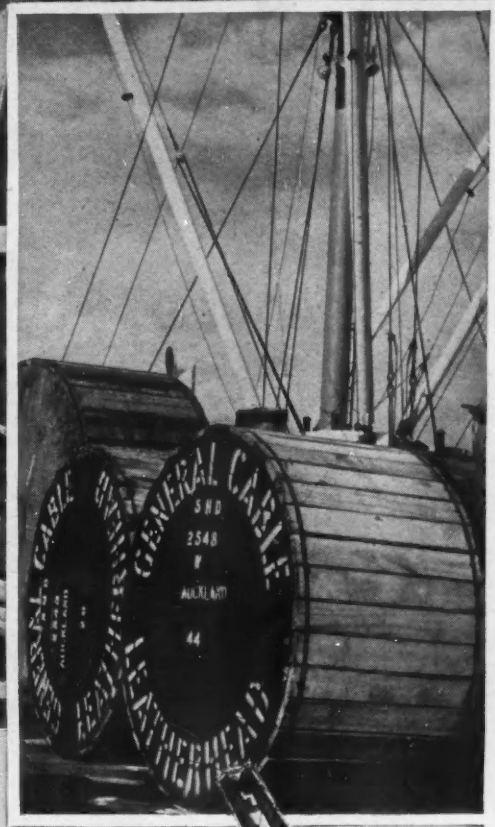

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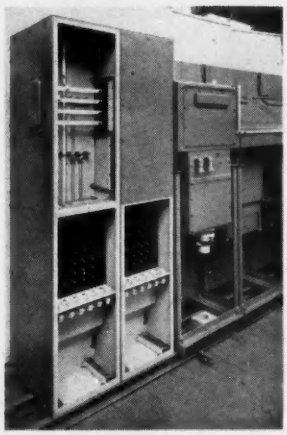

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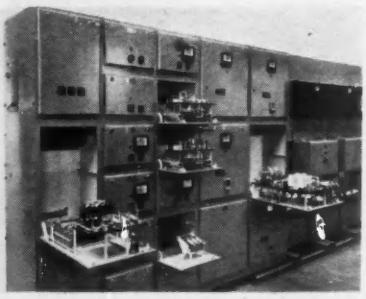

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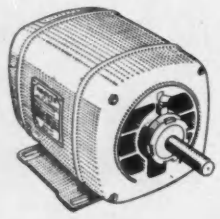

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ELECTRICAL TIMES

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ADEQUATE WIRING WANTED

In a time of restriction, focus rests on bare essentials and important auxiliaries tend to take second place. So it has been with building where the statutory limitations have concentrated attention on providing a minimum standard of shelter and domestic facilities. Understandably, the electrical installation has had to take second place; it could always be extended later, anyhow. Now, however, that building has been freed from restriction we must see that new houses are provided with really adequate electrical installations. This will not be achieved without a special effort by the electrical industry, a campaign not only to make those responsible provide installations of adequate standard but to show the public what such a standard comprises so that they may judge for themselves if there has been any cheeseparing. Too long have we been accustomed to austerity installations with the inevitable concomitants of trailing flexes, and multi-point adapters and amateur extensions. Even the best of pre-war installations can no longer serve us as a standard, for in recent years there has been a great upsurge in the use of electricity in the home and the number of appliances in use is ever multiplying. There are far too many new electrical installations which within a few months prove inadequate to meet this variety of usage and it should be our task to see every new house has the electrical facilities demanded by a modern home.

AN ECONOMIC PRICE

Specialist studies of particular aspects of European economy are one of the lesser-known features of O.E.E.C. The latest offering in this class is an attempted analysis of the price of electricity in its relation to investment in the electricity supply industry: attempted is a fair description, for it is made apparent in the report that no generally applicable solution was developed. Nevertheless, there are several points of interest thrown up by the report, amongst them an indication of the remarkable unanimity of European governments in keeping the price of electricity artificially low during the war years and their aftermath. Yet the report shows as well that most industries and households spend so small a proportion of their budget on electricity that the policy affected individual consumers far less than the supply authorities themselves. Prices kept too low meant insufficient resources to finance new plant when expansion became urgent, and unattractive yields for investors where the industry was still privately owned. It is from such effects as these that Europe's supply undertakings are now struggling to emerge. The

overall tenor of this somewhat inconclusive report is that the expansion of electricity supplies, with all the advantages it holds for industry in particular and the nation as a whole, must not be delayed by avoidable shortages of capital. Charging economic prices for electricity is a means towards this desirable end that is unlikely to cripple financially any consumer.

PLANT MISSES THE TARGET

Last year new generating plant installed was some 90 MW short of the one and a half million kilowatt target agreed with the Government, and this year the short fall will probably be substantially greater. Those who have followed our monthly graph of new plant will have noticed the low commissioning rate and last week Lord Citrine drew attention to this probability of a lower plant installation level this year. The failure to build up to the programme level, he attributes to the steel shortage in 1952, the results of which are now becoming manifest. A considerable improvement is, however, forecast for 1955 but in the meantime every available kilowatt of plant, however obsolete, will have to be kept in service to meet this winter's load. Further, steps are also being taken to reduce the outage time due to breakdown by accelerating plant repair. To this end the B.E.A. are taking the unusual step of establishing their own central workshops in the Midlands and certain of the divisions. This will not only bring such repairs under the closer control of the divisional staff but will relieve the strain on manufacturing resources which are fully occupied with orders for home and overseas.

COAL-FIRED GAS-TURBINES

Since the war the attack to make the gas-turbine suitable for land—as opposed to aircraft—applications has rapidly intensified, and much work has been carried out to extend the versatility of this attractive prime mover to make it operate with fuels other than the usual oil or oil products. Pulverised peat has been tried with a good degree of success, and crushed or pulverised coal has for some years occupied the attention of research workers in this field. The main reason for the attention paid to coal-firing centres round the possible application of the gas-turbine to railway locomotion, a duty in which the simplicity and relatively high efficiency of the machine can be used to good advantage. From the paper presented to the Institution of Mechanical Engineers last week by Professor Mordell, and from the subsequent discussion, it was, however, obvious that much remains to be done. Two schools of thought, for example, were shown as being concerned with basic furnace design, the Canadians favouring the slagging type, while British work was concentrated more on the dry type. Doubts were also expressed on the fouling and corrosion of heat exchanger tubes, particularly where coals with high chlorine or sodium contents were concerned. Despite these divergencies of opinion and possible difficulties, substantial progress has already been made; sufficient at least to enable Professor Mordell to give some details of economic studies. Should these prove accurate in practice, it may not be long before even the diesel electric locomotive may find itself faced with competition, for the savings due to lower maintenance costs, the heat available for train-heating and the lower lubricating oil consumption are sufficient to nullify the increased cost of the gas-turbine engine within an estimated period of only four years.

COAL CONCERN

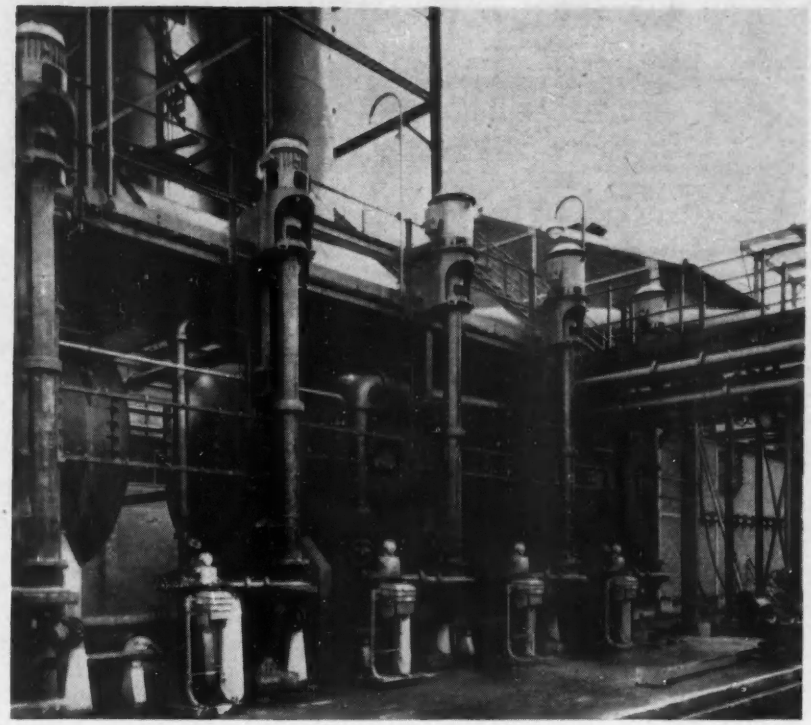
At this time of the year, with winter giving evidence of its rapid approach, it is usual to consider the coal stock position. Reserves at power stations at the end of October totalled 6·18 million tons, estimated by the Ministry of Fuel and Power as equivalent to something over six winter weeks' consumption. This total is slightly below that for the same time last year, when the stocks were returned as effectively 7·1 winter weeks' consumption, based on a demand figure some 9% lower. However, the drop itself is of comparatively little importance, for six weeks' stock should be sufficient to see power stations through any spell of exceptionally bad weather, providing there is no other interference with regular deliveries from the pits. However, stocks of deep mined coal at collieries are 10% down on last year, while still more serious is the way stocks of all classes of open-cast coal have been drawn on so that they are reduced to a mere 0·2 million tons, where 1·18 million tons was available last year and 2·9 million tons at the end of October 1952. Production of deep mined coal has been up on last year, but the increase is only 0·6%, quite insufficient to meet consumers' requirements, which have increased in every category. If the winter is bad, stocks at stations next May will be dangerously low.

TRANSATLANTIC H.V.

Completion of the first transatlantic telephone cable seems almost certain to be the outstanding engineering feat of 1956. The complexity of the undertaking, described in the paper presented last Thursday to the Institution of Electrical Engineers, can hardly fail to excite the interest of all in the industry, whether their work lies in the power or communications field. Yet beyond the sheer magnitude of the scheme, which involves the laying of some 2,300 miles of cable in one run, including electronic equipment working more than 2½ miles deep in the Atlantic, there are two details of special interest to power engineers. The first is that the cable will join Great Britain and Newfoundland with a low-power supply at 4·5 kV d.c.; and the second, that valves and other "radio" components, for so long suspect when introduced into industrial equipment, are yet considered reliable enough for some decades of continuous operation. The high voltage supply provides the constant current of about a quarter of an amp used for anode and cathode supplies; there is a drop of 55 V or more across each of the deep sea repeaters. To minimise the voltage applied to the cable, there is a generator at each end, with series connection and a sea return to complete the circuit. On the second detail of special interest, the answer seems to be the use of specially severe selection and test methods applied to components in any case specially made, away from the quantity production techniques normal in the radio components industry.

Meteor

EXTENSIVE ELECTRICAL INSTALLATION FOR NEW SULPHURIC ACID PLANT AT WIDNES, LANCS



Supply for Acid Production

IN the production of sulphuric acid, the electrical supply for the plant merits close study in view not only of the extensive power requirements but of the product being handled. Moreover, where the works involved is also a new plant, a description of the installation has the added value in giving an indication of modern industrial practice. For these reasons, a recent visit to the works of the United Sulphuric Acid Corporation Ltd., at Widnes, Lancs, which is now nearing completion, afforded a useful opportunity to study such an installation at close hand.

The factory came into being as a result of the sulphur crisis in 1951, when a threatened famine of this raw material reduced available supplies, seriously affecting a major section of British industry which relies on sulphur for the sulphuric acid it consumes. Moreover, as sulphur used in Britain for making the acid comes from America, its import into this country involves a considerable dollar expenditure. To reduce British dependence on this raw material, imported from a source which may again be outstripped by demand, required a greater production of sulphuric acid from indigenous raw materials in ample supply, of which the only suitable sulphur-bearing mineral is calcium sulphate in the form of anhydrite. In consequence, Imperial Chemical Industries Ltd. offered to license their knowledge and experience of the process by which sulphuric acid may be made from anhydrite to large industrial consumers, eleven of which (including I.C.I.) formed the United Sulphuric Acid Corporation to produce acid for their own consumption.

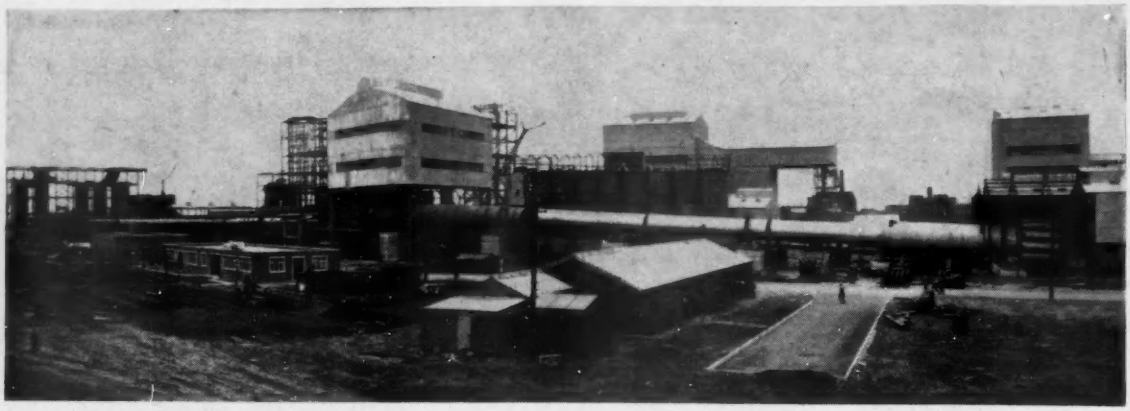
In our heading photograph the general arrangement of pumps, motor drives and starter gear on these acid storage tanks is clearly seen

With I.C.I. acting as technical advisers, plans were put in hand for a plant at Widnes, to cost some £5 millions and to produce nearly 150,000 tons of acid, and just over 130,000 tons of cement clinker (the other product of the anhydrite process) per annum, from nearly a quarter million tons of anhydrite. This output of acid represents approximately 7½% of the country's present sulphuric acid production, whilst saving some $2 millions in sulphur imports.

Manufacturing Process

Basically the process comprises heating an accurately proportioned mixture of anhydrite with materials containing carbon, silica, alumina and ferric oxide, simultaneously producing cement clinker and gases containing sulphur dioxide. Apart from anhydrite, raw materials to be used at Widnes are coke, sand and shale, whilst coal is employed to fire the rotating kilns in which the mixture is heated. In practice, the process is completed in five main stages—handling and preparation of the raw material, production of sulphur dioxide simultaneously with clinker, purification of the gas, conversion to sulphur trioxide and absorption of the latter to form sulphuric acid. Apart from the initial handling stage, the process takes place in two plants which with one comparatively detailed exception are identical, and operate in parallel. This duplication of plant enables a comparatively straightforward electrical distribution system to be employed, the main busbars being in two sections linked with a section o.c.b., and each section supplying approximately half the total load.

For the factory site, the main supply is taken at 33 kV



from a 20 MW line, and stepped down to 6·6 kV through a 7·5 MVA transformer in the Merseyside and North Wales Board's substation on site. This supply then feeds one half of a M.A.N.W.E.B., 150 MVA switchboard through an 800 A o.c.b., the other half being provided with two alternative 6·6 kV supplies, each connected to the bars through a 400 A breaker. From each section of the M.A.N.W.E.B. bars is taken, through an 800 A circuit-breaker, an eight core p.i.l.c.s.w.a.s. cable (two conductors/phase) to supply the Corporation's main h.t., 1,000 A bars, housed in the same building.

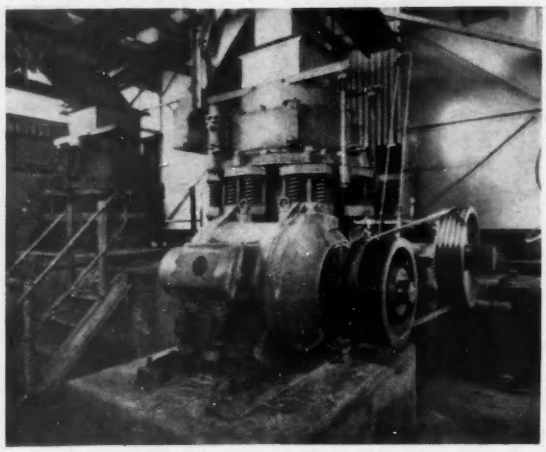
Main H.T. Switchboard

Built up of Reyrolle Class C 150 MVA, 400 A o.c.b.'s, with an 800 A section coupler, the U.S.A.C. board feeds eleven outgoing circuits. Five of these are motors, all started direct-on-line, of which two are 700 h.p. squirrel cage machines, to be employed for driving the two ball mills in which the proportions of anhydrite and other materials are mixed and ground before being fed to silos for storage prior to firing. The remaining three motors are 950 h.p. auto-synchronous machine, for driving blower units. Four further outgoing circuits are taken to four 1 MVA Ferranti transformers, which will provide a main works supply at 415/230 V, three phase. Before, however, turning to the m.v./l.v. distribution and utilisation, attention is given to the remaining two outgoing h.v. circuits.

These two circuits supply power for the remote controlled water pumping station, situated on the north bank of the River Mersey, at Fiddlers Ferry, some miles from the works. From this station is supplied all water used for cooling and similar purposes. The two 6·6 kV supplies are fed in 0·4 sq in. p.i.l.c.s.w.a.s. cables to incoming 400 A, 150 MVA switchgear (also by Reyrolle). On the outgoing bars are taken two supplies for the 340 h.p., s.c. motors driving vertical spindle, split-casing Lee Howl pumps, each capable of delivering 300,000 galls/hr. A third outgoing supply feeds a small transformer for m.v./l.v. supplies for heating, lighting, and the rectifier fed tripping and closing circuits at the station. For protecting the feeders to this substation, the Reyrolle "Solkore" system is employed, whilst the motors, as with those supplied from the main board, have conventional under voltage and thermal over-load protection.

Turning now to the main works distribution system, which, as already mentioned, is at 415/230 V, three phase, supplied from four 1 MVA transformers, the outputs of the transformers supply two halves of a Reyrolle 33 MVA m.v. switchboard through four 2,000 A o.c.b.'s. The two halves of the 2,000 A busbars are connected together through a 2,000 A switch, whilst the neutral bar is solidly earthed through a c.t. to indicate earth leakage current on an ammeter connected to the secondary winding. Each half of the bars supplies approximately half the works load, a system which, as has been pointed out, is facilitated by having two acid production plants operated in parallel.

In view of the corrosive nature of the acid, all paper

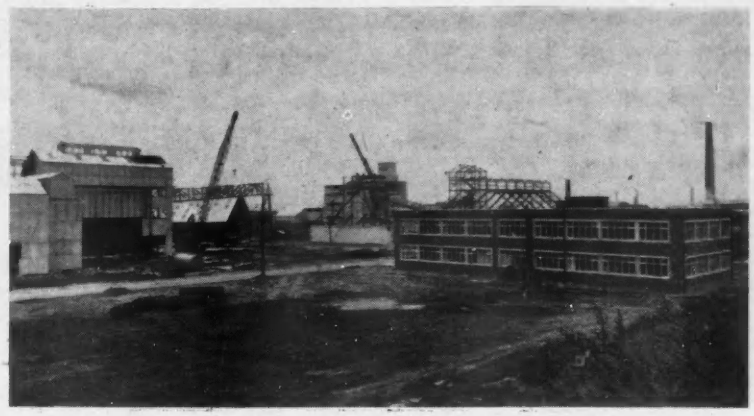


The two crushers which are powered by 75 h.p. slip-ring motors are in the foreground of this anhydrite intake joint

insulated cables used (both for h.v. and m.v. distribution) have, apart from the normal sheathing, armouring and serving, a final acid resisting serving. For smaller sizes, however, p.v.c. insulated, wire armoured cables are employed, with a final sheating of p.v.c. to prevent corrosion of the armouring. Protection of electrical machinery has been effected by having all windings impregnated with a special acid resisting varnish. By standardising on one manufacturer (B.T.H.) for all motors, obtaining such specially-treated machines has been simplified, whilst the use of standard frame sizes wherever possible, has been of considerable assistance in drawing up a planned maintenance scheme. As the process may not be stopped for longer than six hours, the limited time available precludes extensive repair work on a faulty motor whilst in position. In consequence, provision is made to replace such machines entirely, if necessary, by identical machines held against such contingencies.

Further standardisation of manufacture includes the adoption throughout of Ellison oil-immersed starter gear for local control of motors. For remote control, Allen

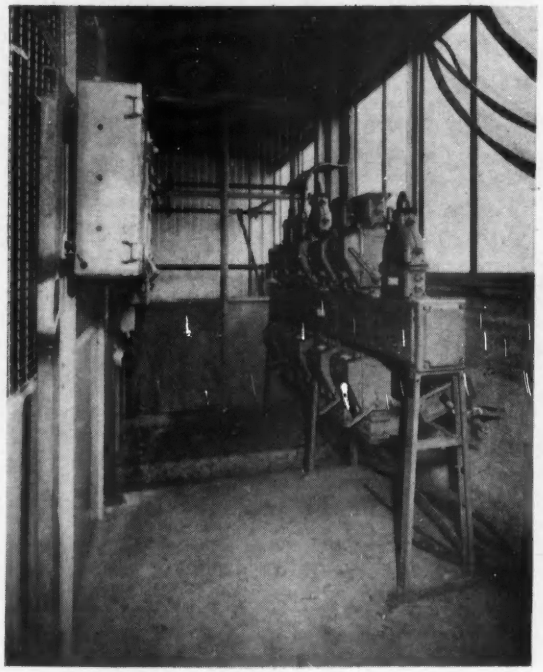
General view of Widnes Factory showing left of p. 694 to right of this page drying and absorbing tower, kiln feed house rotary kilns (with raw meal silos behind), kiln firing house, clinker bunkers and administration offices



West, Brookhirst or Igranic contactor starting units are employed. Ammeters are provided on all starters controlling motors above 3 h.p.

In greater detail, the main 415 V, 33 MVA board supplies eight outgoing circuits. Of these, two are dis-boards taken straight from the bars in the switch room which supply the general lighting for the two (North and South) acid plants, lighting for the administrative and laboratory buildings and the supply for the roadway lighting, which is effected by sodium lanterns mounted on conventional, concrete Class B columns. Only cables supplying the latter are run underground, all other cabling being run on racks, or on slotted cable trays. The remaining six out-going circuits, connected through 1,200 A o.c.b.'s, supply six load centres, or sub-main switch boards, located in the approximate centre of the load they supply. Bearing in mind the duplication of plant, load centres are the north and south acid plants, the two kilns and associated machinery, and the crusher and mill houses. The former embraces the process from raw materials intake to their storage prior to mixing and grinding, and the latter from this stage to storage before fixing.

A good example of a sub-board. This is the workshop and is supplied from the crusher main board and is at present only partially connected



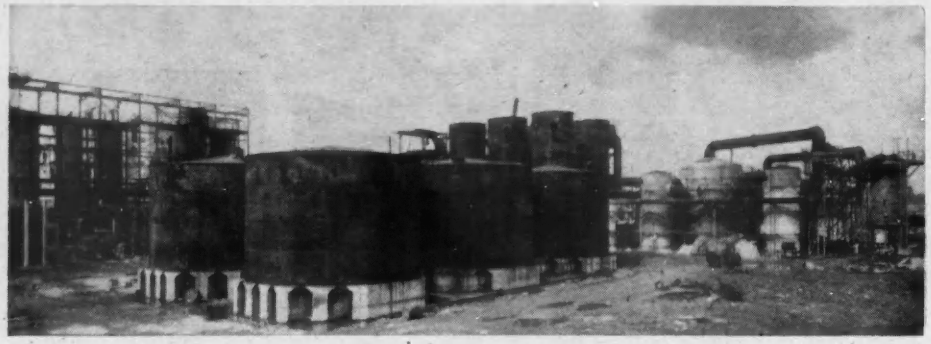
Crusher House Load Centre

Starting, therefore, at the new materials intake load centre in the crusher house, the bars are supplied directly from their outgoing c.b. on the main board by three 0·4 sq in. cables in parallel. From these bars are supplied, for the anhydrite intake and handling, a 60 h.p. motor powering a skip hoist, a 5 h.p. motor driving a belt feeder, and two 75 h.p. crusher motors. All these machines are some of the few slip-ring types in use, most machines having squirrel cage rotors. Apart from lighting supplies, a syntron vibrator and a 35 h.p. angle hoist motor (also of the slip-ring type) the remaining two supplies feed other subsidiary switch boards in the vicinity. All switchgear for load centres and their associated sub-boards is comprised of English Electric c.f.s. units in the standard ratings of 60 A, 150 A, 300 A and occasionally 500 A.

Supplied from one of the sub-boards, located in the vicinity of shale intake point, is a 60 h.p. motor powering a shale crusher, and, via further switchboards, two further motors, 5 h.p. in size, for shale handling, and the magnetic separator which removes tramp iron from the shale. The same sub-board also supplies the workshop switch board, which, in itself, is an extensive installation for a workshop capable of handling almost any repair job on site. Power equipment installed in the workshop includes a 15 h.p., 28 in. "Swift" lathe," a 45 h.p. air compressor, 5 ton crane (involving machines of 8, 7 and ¾ h.p.), a 5 h.p., 8½ in. lathe, and other machine tools aggregating some 46 h.p. Further power is required to supply heating and ventilation equipment amounting to about 18 h.p., whilst two welding outlets are also supplied. The latter, comprising Reyrolle slotted 30 A outlets, are found situated at strategic points throughout the works to provide a supply for welding machines for any repair work which may be necessary. The lighting is also supplied from the board, and, in common with that throughout the plant, is tungsten filament lighting, using standard "Benjamin" industrial reflectors.

A second sub-board supplied from the crusher house load centre provides power for two 20 h.p. elevators, which convey the crushed anhydrite to storage bunkers, and an associated 12½ h.p. belt conveyor. Also provided for are two magnetic separators removing tramp iron from the anhydrite before crushing.

After the shale has been crushed, it is transported to wet storage bunkers, as are the coke and sand after being received at their respective intake positions. The next stage is the drying of these three materials and their mixing



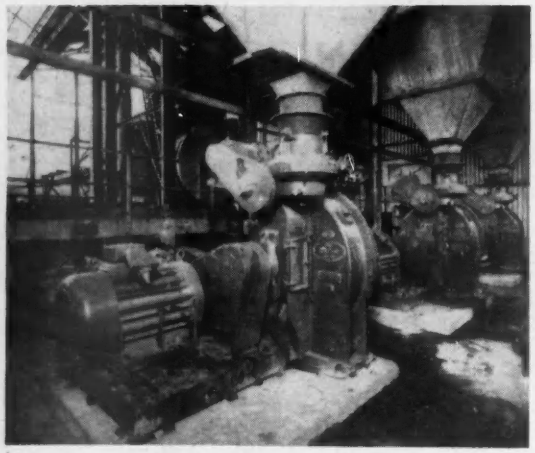
On the left are the absorber towers and tail gas scrubber tower. In centre, acid storage tanks with SO_3 cooler behind. On the right oxidation units

and grinding (in the ball mills) with the anhydrite. The latter, incidentally, does not require drying as it is received dry direct from the suppliers, Plaster Board (Holdings) Ltd., from their mine at Long Meg, Cumberland. The load centre for this stage is located in the Mill House, the bus-bars being directly connected, via two 0·15 sq in. cables from the outgoing o.c.b. on the main m.v. board. This supply is taken from the other half of the board, from that feeding the crusher house.

As in the previous case, the mill house load centre supplies motors directly or via subsidiary boards. Unlike the crusher house, however, there are no sub-switch boards, all secondary boards being fuse boards only. Only one machine is supplied directly, the second works air compressor, which, located in the boiler house, is powered by a 45 h.p. motor. The boiler house itself, however, has its own dis-board, supplied from the mill house centre. There are two, three pass, Davey Paxman, economic, oil-fired boilers having evaporative capacities of 6,720 lb/hr and 2,240 lb/hr of steam respectively. For the larger, the dis-board supplies a 10 h.p. i.d. fan motor, and for the smaller, a 3 h.p. i.d. fan motor. Other plant includes two 5 h.p. oil pumps and oil-heating equipment.

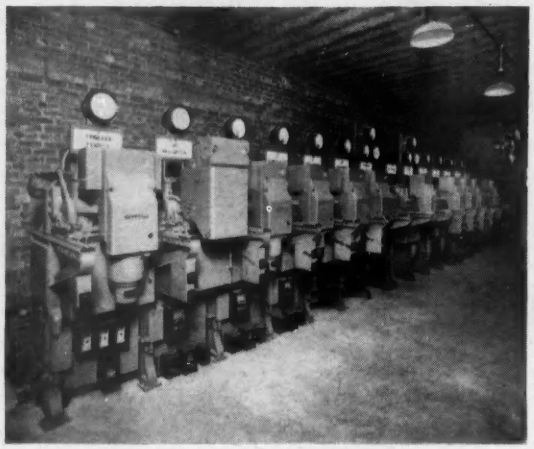
For powering the two rotary driers, in which the coke, and shale and sand, respectively, are dried before being conveyed to dry storage bunkers, are two 15 h.p. motors for the main drives. A 10 h.p. motor powers an exhaust fan for each drier, which is oil-fired. Supplies for these machines are derived, via a tertiary dis-board, from a 100 A distribution board fed from the load centre. Other

The three atritors employed for pulverising the fuel used to fire the kilns, one of which can be seen at the rear. These motors, each of 80 h.p., are the only flameproof types employed on the plant



dis-boards are supplied from the 100 A board, for feeding two 3 h.p. conveyors which carry the dried material from the automatic weighing machines, four 2 h.p. table feeders, and two 3 h.p. f.d. fans for the driers, together with other plant totalling some 5 h.p. The weighers themselves are fed from the load centre via their own dis-board.

Four further subsidiary dis-boards derive a supply from the mill house load centre, and feed conveying equipment or exhaust fans. Included in this plant are two 20 h.p. motors and two 15 h.p. motors, driving exhaust fans for removing solid material in a pneumatic system, four 1 h.p. machines operating shaker gear and a 7½ h.p. gravity bucket conveyor, which transports the raw meal from the ball meals to silos for storage. Supply for this machinery, and for other small motors is derived either directly from



The main h.v. switchboard at the U.S.A.C. works. It is Reyrolle manufacture—150 MVA at 6·6 kVA—and feeds directly five motors aggregating 4,250 h.p. apart from transformers for the works mv/h.v. supply

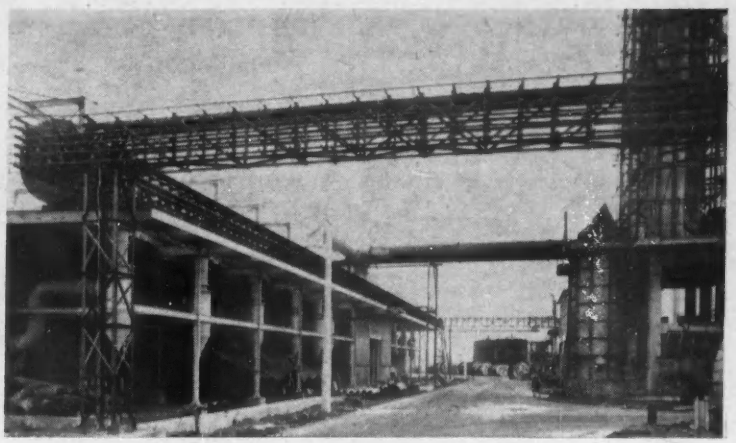
these secondary boards, or indirectly via intervening dis-boards, as circumstances dictate.

Kiln Load Centre

After storage in silos, the raw meal is conveyed to the feed end of the kilns, for firing to produce sulphur dioxide. Each of the two kilns has its load centre, from which supplies for this purpose, and for conveying and crushing the clinker, are obtained. Each load centre is fed from its own half of the main m.v. switch board and is virtually identical with the other. Each load centre, however, falls naturally into two parts, one supplying the firing end of the kiln and the other the feed end and hence the main supply (transmitted over three 0·4 sq in. cables) initially

supplies busbars from which a further cable, taken directly from them, feeds the kiln firing house, whilst the kiln feed house is fed from the same bars through a 500 A switched fuse, fused at 600 A.

Of the two boards, the firing house takes the larger load, having to provide power not only for the kiln drive but for three p.f. mills supplying fuel for the kiln, and the conveying equipment to remove the clinker. From the firing house bars, then, is supplied a 130 h.p. motor for the kiln drive and 80 h.p. flame-proof motors driving p.f. atritors (two are supplied from one of the load centres, and one from the other). Also directly supplied from the firing house bars are a 35 h.p. motor powering a jaw crushing machine for the clinker, and a special outgoing circuit for essential services. These comprise certain lighting points, and fire pumps, and the switchgear is painted red to draw attention to it to prevent it being switched off.



Representative view of the cable mounting employed at the works. In only a few cases such as supply for the roadway lighting are cables run underground

Clinker handling equipment is supplied through its own dis-board, which serves a 12½ h.p. hot clinker elevator, 15 h.p. swirling tray conveyor, and via a tertiary dis-board, a 7½ h.p. vibro unit, and 5 h.p. belt conveyor, which convey clinker to lockers and bunkers.

The other half of the load centre, in the kiln feed house, serves two 12½ h.p. motors driving elevators for raw meal conveying to silos, and to the kiln feed. It also supplies a 60 h.p. granular unit, a 25 h.p. stirred bunker, and a further three 7½ h.p. motors driving other raw meal handling machinery.

It will be appreciated, however, that much of the raw meal and clinker handling necessary is common to both kilns, and supplies for this equipment may be taken from either one or other kiln load centre via change-over switchgear. This provision ensures that, in the event of failure of the supply to one of the centres, the other will be able to provide a supply to deal with the materials handling for the one plant still in operation. Two sets of these change-over supplies are provided, one taken from both firing house busbars and the other from the feed house bars. Fed from the latter is the pneumatic raw meal handling equipment, requiring some 22 h.p. of plant, together with dust conveyors, rotary feeders, exhaust fans and pumps of total power of some 100 h.p. From the firing house bars the change-over switches supply dis-boards in the clinker store, from which is fed some 65 h.p. of machinery, largely used for conveying clinker to and from storage bunkers and weighing machines.

Acid Plant

Two final load centres remain to be considered, one for each of the acid plants in which the sulphur dioxide is converted to sulphur trioxide and absorbed in sulphuric acid. Here again, the two plants are identical with the exception that the north plant also incorporates an oleum tower. Consequently the load centres are, where supplies to the acid plants are concerned, identical, but additional supplies for the blower house are taken entirely from the south plant switch board and hence it differs from the north plant in this respect. As with the kiln load centres, supplies for certain common services may be taken from either centre, through changeover switchgear.

Supplied direct from each load centre are eight 45 h.p. motors driving either acid or cooling water circulation pumps. The presence of the oleum tower in the north plant adds an extra two of these motors to its load. Also supplied by each centre directly are a 125 h.p. and two 75 h.p. machines, again employed for pumping and a 120 h.p. compressor unit. Power factor correction equipment in the form of a delta connected capacitor bank providing 70 kVAr is also provided and apart from the 6·6 kV auto-synchronous machines, will be the only p.f. correction plant in use. Fed indirectly from each load centre, via a subsidiary switch board, is a 12½ h.p. effluent spray pump, a 3 h.p. effluent stripper fan and 2 h.p. smoke box fan. The latter is employed for cleaning the sulphur dioxide and is associated with five electrostatic precipitators, each supplied at 415 V single phase.

As has been mentioned, the south plant load centre provides a number of further supplies, of which the bulk is a supply for the blower house. Here is installed a 300 A switch board feeding a 23½ h.p. air compressor supplying the instruments in use on the plant. Further supplies are provided for three fans, and a 630 W heater for each of the 6·6 kV blower motors, interlocked with three 4 h.p. blower pony motors.

To complete the installation are supplies available from either load centre via change over switch gear. Apart from acid pumping gear provided for loading acid into transport and other purposes—aggregating some 110 h.p., these supplies provide power for the clarifying unit at which the Mersey river water is received on the site. The 24 in. pipe from the Fiddlers Ferry pumping station empties into a "Dorr" clarifier, rotated by a 5 h.p. motor, from which the clarified water discharges into a concrete sump, where it is handled by three 140,000 gall/hr centrifugal pumps discharging into a cast iron main for distribution round the plant.

The main contractors for the construction of the plant are Simon-Carves Ltd., in collaboration with Simon Handling Engineers Ltd., and the electrical sub-contractors, W. H. Smith and Co., a Manchester firm. Clearing and levelling the site began in October 1952, whilst the commissioning of the first unit is due in April next year. Construction work offered a number of special difficulties, particularly the laying of a 36 in. main drain through which effluent is removed. Fabricated in "Alkathene" to prevent corrosion, the drain runs under the St. Helens canal, part of which had to be emptied, and under an adjacent railway line. Whilst being installed there, the surrounding ground had to be frozen artificially to prevent ingress of water.

Using M.K.S. Units in determining Fixed Losses

PROCEDURE IS DESCRIBED FOR ROTATING MACHINES EMPLOYING THE RETARDATION METHOD OF MEASUREMENT

By J. E. MACFARLANE M.I.E.E., A.M.I.MechE.

THE fixed loss in rotating machines consists of the core loss, due to hysteresis and eddy current losses in the iron, and the total friction and windage loss. These losses are not stray losses as they are sometimes erroneously called, but can be separated by retardation tests. The stray loss is due to load effects in both the iron and the conductors and is not easily calculated but can be estimated from short-circuit tests on similar types of machines. The separate losses of a machine being known the declared efficiency can be obtained by summation of losses with an agreed allowance for stray load loss as given in B.S.S. 269–1927.

The retardation method is applicable to large machines having armatures or rotors with considerable inertia. With smaller machines the moment of inertia may be increased by fitting a flywheel to the shaft. To carry out the test the machine is run up to a speed some 10 to 20% higher than normal. The drive is then removed and readings of speed are taken at equal time intervals whilst the armature is running down. The loss at some definite speed must be known, either from a no-load test or some external load supplied at some instant during the test, together with the value of excitation.

The kinetic energy of rotation is $\frac{1}{2}\,J\omega^2$; in m.k.s. units J is the polar moment of inertia in kg–m², ω is the angular velocity in radians/second and the kinetic energy is in watt-seconds or joules.

The time rate of change of energy is power, which when unexcited is dissipated in friction and windage losses if not coupled to any mechanical load. When excited there is the additional core loss depending upon the amount of excitation.

From $KE = \frac{1}{2}\,J\omega^2$, differentiating with respect to ω,

$$\frac{d}{d\omega}(KE) = J\omega,$$

$$\text{then } \frac{d}{dt}(KE) = \frac{d(KE)}{d\omega} \times \frac{d\omega}{dt}$$

$$\text{hence the power } P = J\omega\frac{d\omega}{dt} \qquad \text{——————(1)}$$

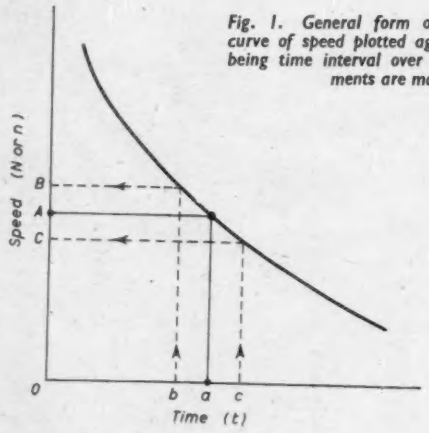


Fig. 1. General form of a retardation curve of speed plotted against time BAC being time interval over which measurements are made

The decrease of kinetic energy during a time interval t sec. is $c\,(n_1^2 - n_2^2)$ where c is a constant for a given machine and n_1 and n_2 are the respective speeds in revs./sec. at the start and finish of the time interval t. The mean retarding power producing the change of speed is

$$\text{Decrease of KE/Time} = c(n_1^2 - n_2^2)/t$$

$$= 2c\left(\frac{n_1 + n_2}{2}\right)\left(\frac{n_1 - n_2}{t}\right) \qquad \text{——————(2)}$$

But $(n_1 + n_2)/2$ is the average speed over the short time considered and $(n_1 - n_2)/t$ is the time rate of change of speed. Rev./min., N can be used if more convenient. Fig. 1 shows a retardation curve of speed N plotted against time t. Let OA be the speed at which the input to the armature was measured or is known and OB and OC the respective speeds at small equal time intervals ab and ac each side of the time Oa corresponding to speed OA.

If P is the power at speed OA, then

$$P = 2c\left(\frac{OB + OC}{2}\right)\left(\frac{OB - OC}{bc}\right)$$

from which the constant c is obtained, as shown in the following example.

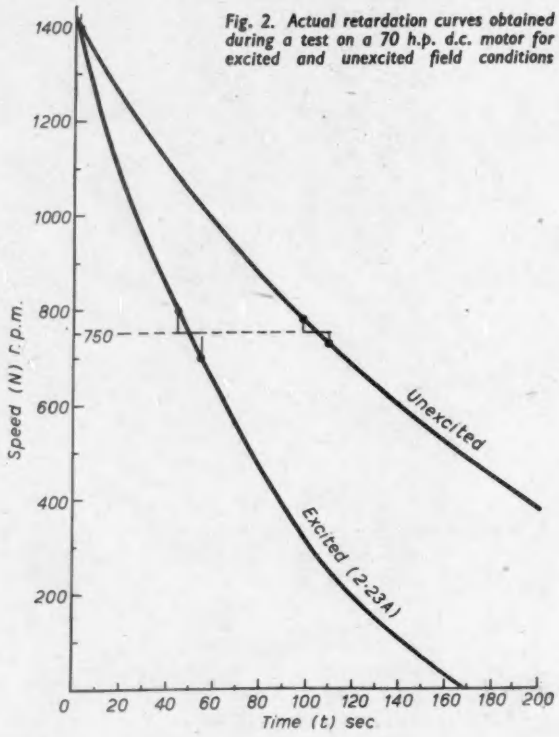


Fig. 2. Actual retardation curves obtained during a test on a 70 h.p. d.c. motor for excited and unexcited field conditions

Retardation Test

Curves obtained from a retardation test on a 220 volt, 70 h.p., 750/1,200 r.p.m., d.c. motor are given in Fig. 2. The armature no-load loss at 750 r.p.m. is 1,750 watts with full field excitation of 2·23 amp. At 750 r.p.m. a time interval of 10 sec. is taken, 5 sec. on each side of the time for this speed, giving speeds of 800 and 700 r.p.m. respectively on the "excited" curve. The constant c is evaluated from

$$1{,}750 = 2c\left(\frac{800+700}{2}\right)\left(\frac{800-700}{10}\right)$$

$\therefore\ c = 0{\cdot}1166$

To obtain the friction and windage loss the "unexcited" curve is used and the same time interval is taken, the constant c inserted and the power lost in friction and windage is given by

$$P_o = 2 \times 0{\cdot}1166\left(\frac{775+725}{2}\right)\left(\frac{775-725}{10}\right)$$

$\therefore\ P_o = 875$ watts

By subtraction from the no-load loss the core loss is 1,750 − 875 = 875 watts at 750 r.p.m.

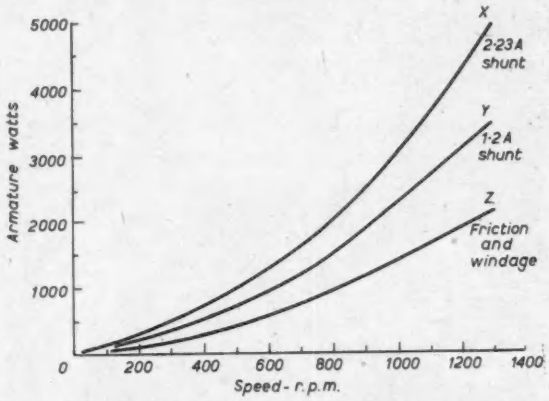


Fig. 3. No load tests at normal and reduced excitation gives this family of curves the lowest being obtained from retardation test figures

The series of no-load tests on a machine at various excitations give a family of curves similar to those shown in fig. 3. The curves OX and OY are at normal and a lower excitation (for 1,200 r.p.m.). From the retardation test figures the friction and windage curve OZ can be derived. The difference between curve OZ and the other curves is the core loss at the various excitations. Assuming that the hysteresis loss is proportional to the speed and the eddy current loss is proportional to the square of the speed, the iron losses can be separated if desired, but such separation of losses should be treated with caution even though it gives an indication of their relative values.

The friction and windage curve is calculated using the retardation and no-load curves and the calculated figures are given in the first two lines of Table 1 below.

TABLE 1. FRICTION AND WINDAGE LOSS

Speed (N) r.p.m.	500	750	800	1,000	1,200	1,300
Power loss (P_o) watts	410	875	990	1,370	1,830	2,070
P_o/N watts/rev. ...	0·82	1·165	1·233	1·37	1·525	1·59

Assuming the friction loss is proportional to the speed and the windage is proportional to the square of the speed then $P_o = aN + bN^2$ where a and b are constants for the machine. Dividing throughout by N gives watts/rev. as a straight line graph, this is plotted in Fig. 4. The constant ordinates, a, multiplied by the speed gives the friction loss whilst the variable ordinates, such as bN, multiplied by the speed gives

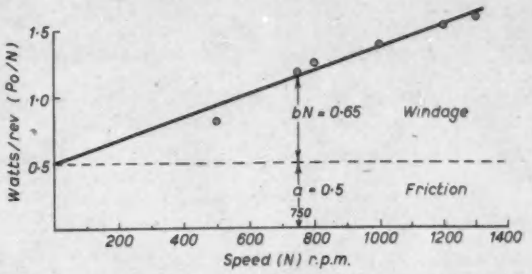


Fig. 4. By dividing the friction and windage losses by the speed, the above loss/rev. curve can be obtained and the friction and windage components then easily separated

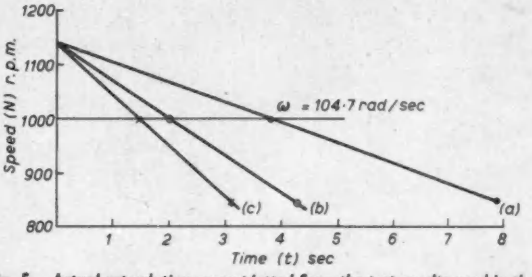


Fig. 5. Actual retardation curve plotted from the test results used in the example in the test where (a) is that obtained with no excitation (b) with normal excitation and (c) with the armature loaded

the windage loss. Taking 750 r.p.m., friction loss = 0·5 × 750 = 375 watts and windage loss = 0·65 × 750 = 487 watt, giving a total of 862 watts which is in reasonable agreement with the original total of 875 watts.

Polar Moment of Inertia

This can be obtained from equation (1) using the no-load power and figures from the "excited" curve at 750 r.p.m.,

$$P_1 = J\omega\frac{d\omega}{dt}$$

substituting in this equation

$$1{,}750 = \frac{J2\pi\ 750}{60} \times \frac{2\pi}{60} \cdot \frac{100}{10} \quad (\omega = 78{\cdot}5)$$

$\therefore\ J = 21{\cdot}3$ kg. m²

If the weight of the armature is known the radius of gyration k can be found from $J = mk^2$. The above machine had an armature core of 11 in. radius and a commutator of 6 in. radius. The mean value of J from several calculations is 21·89 kg.m² and the armature mass (m) is 658 kg. Hence the radius of gyration $k = \sqrt{21{\cdot}89/658} = 0{\cdot}183$ metres. This is 7·19 in. or 65·4 per cent of the armature diameter compared with 70·7 per cent for a solid cylinder.

Energy of Rotation

The kinetic energy $\frac{1}{2}\ J\omega^2$ joules is equivalent to the work unit of Newton-Metres. Using the figures above it is $\frac{1}{2} \times 21{\cdot}3 \times 78{\cdot}5^2 = 65{,}600$ Nw-m. To convert to kg.m divide by 9·81 this gives 6,700 kg.m. Again multiplying this by 7·233 gives the result as 48,400 ft lb.

A further example will show how this method can be used when the armature is generating as it is running down. The following test results (Table 2) were obtained during a retardation test on a d.c. machine.

With the armature loaded in test (c) when the machine passed through its normal speed of 1,000 r.p.m., the armature current was 1·6 amp. at 200 volts. Determine (a), the friction

and windage loss; (b) the core loss, both at normal speed; and (c), the moment of inertia in kg.m².

The three curves are plotted in fig. 5 and the respective

TABLE 2. RETARDATION TEST RESULTS

Speed (N) r.p.m.	1,140	1,000	850
Time (t) sec.: Unexcited... ...	0	3·5	7·9 (a)
" " Normal excitation	0	2·0	4·45 (b)
" " Armature loaded...	0	1·5	3·10 (c)

speeds are taken over a 1 sec. interval about 1,000 r.p.m. The calculations are carried out in tabular form in Table 3 below the generated load being given by the difference in powers of tests (c) and (b), and $\omega = 104{\cdot}7$ rad./sec.

Hence 330 J = 320 w.

$\therefore$ J = 0·97 kg.m²

Substituting the value of J, the friction and windage loss = 417 × 0·97 = 405 watts and the core loss = 298 × 0·97 = 289 watts at 1,000 r.p.m.

TABLE 3. TABULAR CALCULATION

Curve	Speed over 1 sec. N_1	Speed over 1 sec. N_2	$\frac{dN}{dt} \times \frac{2\pi}{60} \times J\omega = P$		Difference
(a)	1,020	982	38	3·98	417 J
					298 J
(b)	1,035	970	65	6·82	715 J
					330 J
(c)	1,050	955	95	9·96	1,045 J

From the above it will be seen that the use of m.k.s. units in what are essentially mechanical tests gives a convenient arrangement with practical electrical units, as shown in previous articles on m.k.s. mechanical units by the author, and published in the ELECTRICAL TIMES, 31st December, 1953, and 5th August, 1954.

PRINTED WIRING CIRCUITS

Advantages of Use in Radio and Television Receivers

ALTHOUGH printed circuits have been under development for several years their application to commercial wireless and television has not been much in evidence. Techniques have now developed to a sufficiently high standard to permit their use, with economic advantage, in production runs. The Telegraph Condenser Co., for example, have now entered this field using the method whereby a pattern of copper foil connecting leads is bonded firmly on a laminated phenolic or other phenolic base. This panel is then drilled or punched to permit components to be inserted, i.e. valve holders, condensers, resistors and so on; after which the completed assembly is fluxed and dipped in a solder bath so that all connections are made in one operation. In this manner incorrect wiring and badly soldered joints are eliminated.

The simplicity and reliability of the printed wiring method of assembly is expected to show an appreciable saving in cost, the main saving being in assembly labour, inspection and "trouble-shooting." There will also be a saving in material costs where tag panels and other insulators may be dispensed with. In many cases, small components such as low capacity-coupling condensers and tuning inductors for television receivers may be printed at no extra cost. The saving in inspection time is brought about by the greater reproducibility and reliability of the wiring and soldering which ultimately will be also reflected in reduced servicing of receivers.

In many cases, printed wiring shows technical and practical advantages apart from cost savings, over the normal methods hitherto used. Instances of this are the constancy and reproducibility of inductors in tuned circuits (such as filters), reduced hum level in high gain amplifiers due to the elimination of circulating currents in metal chassis, a guarantee of identical wiring in all receivers, and dimensional advantages where thin flat circuits can frequently be arranged to make the best use of available space.

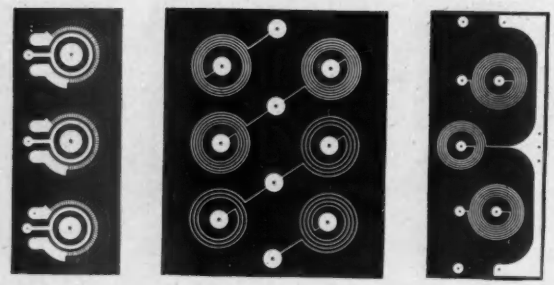
Printed circuit of radio chassis

Many types of circuit may be treated by this method including those of radio receivers, TV receivers, i.f. amplifiers, transistor amplifiers, hearing aids, filter networks, frame aerials, potentiometers, switches, telephone line panels and computor panels.

To improve the space factor, three-dimensional wiring can be produced by using flexible base material which can be folded, or by using a laminated phenolic base which can be bent after treatment.

As examples of this latter technique may be instanced i.f. transformers for television receivers and amplifiers with control panels which though printed flat will be folded to shape after assembly. There are, of course, numerous other applications.

When ordering printed circuits it is recommended that preliminary discussion shall take place with the T.C.C. engineers who will advise on the translation from circuit diagrams to printed circuits. The making of blocks or stereos, and at the moment the preliminary drawing can also be handled by T.C.C.



Three examples of printed circuit are illustrated here. Left is a three-section control panel ; centre is a high-pass filter for 300 ohm balanced feeder for use with a television receiver, and on the right is a high pass filter for a 70 ohm coaxial feeder also for use with television receiver

READERS' VIEWS

Correspondents writing under a pseudonym are asked to submit their names in confidence to the Editor

British Standards Abroad

HAVING been abroad to New Zealand and other Dominions and only just returned, looking through the back numbers of your valued journal, I noticed a comment of "Meteor," dealing, I believe, with B.S.I. and some cable specifications at issue, that: "Purchasers are likely to attach more importance to a manufacturer's reputation than to mere compliance with some published specification."

This is quite true but abroad it is another matter, where the B.S.I. specifications are often regarded as having statutary validity, which, of course, they have not. I think it will be of considerable interest to mention, that a foreign power, with whom we did some thousands of pounds of exports, in the last year quoted the B.S.I. specification, which was far inferior to our standard equipment and requested to know why we did not use the specification.

We informed them that as a reputable and experienced firm, as designers and manufacturers of the safest and most efficient electrically heated flying equiment, which was adopted in the last war by the U.S.A. Air Force as standard in preference to both the U.S.A. and British Governments' equipment, we could guarantee our equipment.

The final stupidity was an objection to C.M.A. flexible, the cable we used, 23/36 non-kinking for mechanical strength, as it had to carry only 0·3 amp, but they would pass a German flexible cable, if we would fit it. This, of course, we point blank refused to do, so were disqualified, much to the disgust of our clients in that country.

It is important that the correct status of B.S.I. specifications should be made clear to those overseas who use them and there should be no implication or other indication that they carry with them statutary authority for ensuring compliance with them.

A. V. Summers, Chairman,
MILLIWATT LTD., LONDON, N.W.1.

Fluid Filled 'Radiators'

PEREGRIN in his article of 14th October, stated that fluid filled radiators are a boon and a "most efficient" means of heating. Before we get a flood of these "efficient" systems on the market a few remarks on the performance of these radiators is not considered out of place. Firstly, the name "radiator" is most unsuitable for these units, the surface temperature is around the 160–180° F mark and at this temperature the amount of heat emitted as radiation will only be about 15–20% of the total heat emission, the remainder being given off as convection. Therefore they will perform in a similar manner to the conventional water filled radiators with all the inherent disadvantages of convection heating, the most important of these being the long preheating periods required to warm the rooms before use. When the requisite air temperature for comfort has been obtained the highest temperatures are always up by the ceiling with the consequent high heat loss. Also as air is the medium of heat transfer from the appliance to the occupants of the room, any form of ventilation which is introduced to combat the stuffy conditions, will immediately remove some of the heating medium and the efficiency of the system will be reduced. These are the three points which are considered to have the main effects on the high running costs of this form of heating. A personal observation is that some form of guard is considered necessary due to the innocent appearance of a surface which is capable of giving a nasty burn.

The answer as far as the domestic market is concerned lies, in my opinion, in radiant heating from fires which have been designed to cater for *all* the fundamental requirements for bodily comfort. Radiant heat is available immediately without the long preheating periods necessary for convection heating and also available where it is required, namely, the lower levels of the room. Ventilation can be introduced, because air is not used as the heat transfer medium and comfort conditions can be achieved with a lower air temperature than with a convection system. The safety requirements are met by the Fireguards Act and there is, of course, the visual warning when the fire is approached.

The future, therefore, should be bright for radiant heating with comfort conditions more rapidly and economically produced, and without the initial ageing period which "Peregrin" mentions for fluid filled radiators.

A. W. Bates,
CRUMPSTALL, MANCHESTER.

* * *

IN reply to Mr A. W. Bates, my remarks were not intended as a dissertation on heating generally but merely to compare the electric radiator with the conventional hot water radiator. The latter is the most used heating device in this country, and probably in the world. Most commercial and industrial buildings use it, and most house owners install a central heating system if they can afford it, or covet one if they cannot.

I feel, therefore, on very firm ground indeed in stressing the advantages of the comparatively new electric radiator, as compared with such a well-established system as solid fuel central heating. I also have the proof of the pudding, which is more convincing than Mr Bates' arithmetic. Having tried most forms of electric heating I find that two 1 kW fluid filled radiators will maintain a comfortable temperature in all parts of a living room or office, say 14 ft square. A 2 kW radiant fire makes a small area hot, leaves the rest of the room cold and encourages the occupants to crowd round the fire.

Or does Mr Bates prefer a myriad of radiant bowl fires dotted all over the place. If that is the kind of future he means, "bright for radiant heating," I prefer to be old-fashioned and put my trust in the fluid-filled radiator, however "unsuitable" its name may be.

Peregrin.

Farm Wiring

IN his interesting article in your issue for the 4th November, "Megohm" gives only two alternatives for interconnection between farm buildings, the use of underground cables and the erection of overhead lines for carrying of insulated conductors on catenaries. There is a third very useful method, running flexible non-metallic conduits underground and drawing in the normal p.v.c. insulated conductors; many such interconnections have been made, and the writer has knowledge of one, made nearly ten years ago, passing under a manure heap in a stable yard—surely as good a test as it is possible to visualise.

It is not difficult to find danger-free routes for underground conduits, and their cost is about half as compared with underground cable or overhead erections. Personally,

I feel it essential to avoid overhead runs on farms, as invariably the labourer with a long ladder manages to bring one or both of the conductors down.

As "Megohm" approves the use of non-metallic conduits for the farm wiring I am sure he will be interested in these details of experience in extending these same conduits down underground to the next building, thereby still further reducing the high cost of farm wiring.

T. C. Gilbert, M.I.E.E.
FOLKESTONE, KENT.

Dangers Through Earthing

IN your issue dated 21st October you comment on the dangers introduced when earthing is neglected and also point out that this same earthing can become an important factor in causing a fatal accident. I note that you refer to the living room as an "earth free" situation. According to the I.E.E. Regulations, 12th Edition, under the heading "Definitions" it would appear that as the living room usually contains a radio receiver with a bare or lightly insulated aerial or earth connection, such a situation would not be deemed to be "earth free."

"Helios",
WREXHAM, DENBIGHSHIRE.

* * *

THE current views expressed in your valuable correspondence columns has, if nothing else, drawn attention to the lethal danger of 3-pin type socket-outlets with phase and neutral connections reversed. Attention has been directed to an increased use of double pole switches for controlling apparatus; fitted as an integral part of electrical appliances it would reduce accidents. In the writer's opinion however this does not go far enough and he would press for nothing less than a complete revision of I.E.E. Wiring Regulation 604 so as to permit only double-pole type switch-socket outlets. At present this suggestion only applies to sub-clause (k) of the above regulation, i.e. applicable only to reversible plugs or connectors.

For those who raise the question of cost: from a leading manufacturer's catalogue the average increase per point would be 9d. The recent Home Office report on domestic electrical fatalities gave a figure of four deaths caused by reversed polarity in the past year. Thus an insignificant price increase could result in the saving of lives.

M. Nidle,
LONDON, N.W.4.

* * *

I WAS particularly interested in the correspondence published in your recent issues on the question of earthing. Some years ago I occupied a flat in a modern block in central London. The rooms were all fitted with three-pin switched socket outlets and also with central heating radiators. One day, while investigating the electric cooker control unit in the miniature kitchen I was astonished to see that there was no earth connection whatsoever to the control unit, and that the cooker itself, though apparently earthed was in fact earth free. Removal of the covers of the switch socket outlets showed a similar state of affairs.

C. Bush,
LONDON, W.C.1.

An Installation Problem

I WOULD like to make a few comments on Mr W. Satchwill's letter (issue of 14th October) which appeared under the heading of "An Installation Problem." I must say first, that I am not a manufacturer (in the true sense of the word) and, therefore, may not be in order in giving my views on this painful but very important matter. Mr Satchwill has brought up a most important point in the design of modern "boxes," "switch-boxes" and so on. I have no hesitation in saying that the majority of these boxes, switch-fuse and—perhaps most important—flush socket-outlet boxes as used in the ring installations on modern housing estates, are badly designed. They do not permit anything other than a coupling and a male bush to be used for fixing conduit, and in any ring circuit there are at least two conduits to every box. In many cases these conduits enter side by side and there is insufficient room in the box to permit the use of locknuts and ring bushes (a much better earth continuity joint than a coupling and male bush). This is to say nothing about the difficulty of tightening the bushes to bond the conduit to the box.

I would like to praise manufacturers for their "knock-outs" to suit nearly every occasion and situation, but it is surely just as important to make the boxes such that the fixing of conduit to them is easy and effective. If this task is difficult it will not be carried out as effectively as it should be. Mr Satchwill appears to hold other views with respect to ring bushes, but from my early days in the Electrical Industry, I was always taught to use a locknut on either side of the box with a ring bush to complete the final covering of the conduit thread. The locknuts were responsible for the sound clamping of the box and not the ring bush. There is no doubt about the locknuts and the ring bush being the real job, if that is all we require. It may not be so neat in appearance but in many cases the joints are hidden, and even where they are not, efficiency should come first. In my estimation it is a matter for the designer to put right. Incidentally, some couplings are uneven at their ends and make the area of contact with the boxes small, and it is often difficult to tell if the male bush is bonding the box or not. This does not arise in the case of the locknuts.

J. H. Robinson,
FIFE.

Tribute to Dr Paterson

NO man has done more for the welding industry than Dr John Paterson and it was therefore fitting that a luncheon was given last week in his honour, to mark his retirement. The Chairman, Mr W. W. Watt, proposed the toast recalling Dr Paterson's long career in electric welding. He is a past president of the Institute of Welding and played a prominent part in the British Welding Research Association. When, in 1939, the Arc Welding Electrode Section was formed, a technical committee was set up of which Dr Paterson has been chairman until a few months ago. It was his inspiration behind the three volume survey on welding design that will shortly be published. His services have been widely used by the Admiralty and government departments and he has represented this country abroad on numerous occasions. Most of all he has been an enthusiast for welding, not for the particular firm with which he was connected but for the industry as a whole. He has left his mark on the industry not only by reason of his technical ability but by his personal charm. This tribute was supported by Mr R. B. Clipsham and Mr J. M. Sinclair, chairmen of the Arc Welding Plant and Resistance Welding Sections respectively.

In replying, Dr Paterson thanked the members for their magnificent gift of a television set which they had presented to him. Welding, he said, is not an industry by itself, it is a tool in industry. It is something basic in nearly all our engineering industries and the knowledge that you are helping the progress of the nation must be its own reward. It is significant that if a new metal were discovered, it would have no market value unless it was weldable. Finally, Col B. H. Leeson, director of B.E.A.M.A., spoke of his appreciation of Dr Paterson.

Heat Pump Experiments

DEVELOPMENT WORK BY THE S. W. ELECTRICITY BOARD

THE status of the heat pump in the domestic and indeed in the industrial field has not yet been established with any degree of certainty. Indeed, it appears that this fundamentally simple thermodynamic machine is generally regarded with suspicion as providing something for nothing. Yet sufficient data is now available to prove that the heat pump can be a satisfactory and economic machine, provided it is used in the right circumstances and is correctly designed.

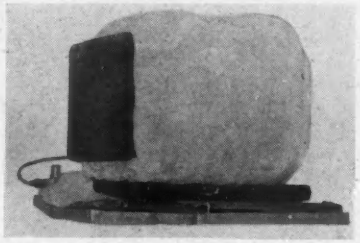


Fig. 1. Continuously run evaporator in one of the installations. This uses an immersed Sterne compressor on the hot side to produce water at temperatures up to 170°F

For these reasons, the work being carried out under the aegis of the South Western Electricity Board, under the direct supervision of Mr G. O. McLean, the Chief Engineer, is of interest. It may be recalled that Mr McLean was concerned with the development of the Brentford Duo-Therm, a combined larder cooler and hot water provider, which when placed in the larder extracts heat from the air and transfers it to a 30-gallon tank of hot water. In this case the unit is compact. the lagged hot water tank being in close proximity to the pump and to the cool side.

Further experiments are, however, being carried out by the Board using standard English Electric 1/6 h.p. sealed refrigerator units. Six of these units have been generously given by the company to the Board for this work, and research in the domestic field is being carried out with them.

Domestic Installation

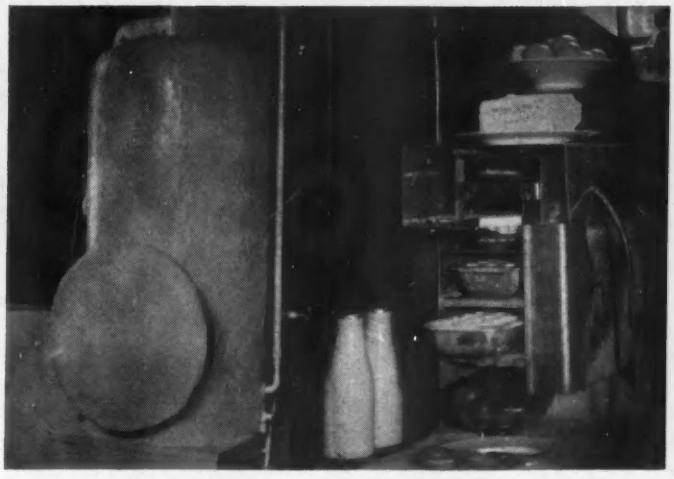
Starting, therefore, with the domestic use of the heat pump it is first necessary to survey the requirements. First, there is always a need for a cold room for food preservation. This need not necessarily be refrigerated to a low temperature. Bacteriological activity drops off rapidly with decreasing temperature, and is in most cases virtually negligible in the 40-50° F range. Secondly, there is a demand for hot water for household use, which in turn allows thermal storage to be used. The major difficulty with a heat pump, therefore, lies in the provision of a low temperature heat source with sufficient thermal capacity to provide the necessary low grade heat to be pumped up to high grade heat at a temperature sufficiently high to be useful in the home (about 150° F). In the majority of cases, the low grade heat may be taken from the air, but if large quantities of heat are required, a high thermal capacity source such as the earth (providing the temperature gradients in the soil are not excessive) or bulk water should be used.

At Bristol several experimental runs are being carried out. In the Board's showrooms, is a Duo-therm equipment, which incidentally provides up to 50 gallons a day of hot water for the demonstrators of washing machines for an average consumption of 6 units. Two selected employees of the Board, however, are carrying out experiments with specially-designed installations. Both these use E.E. units with methyl chloride or Freon 12 as a refrigerant. The attack in these cases has been to include the complete pumping unit within the hot water side. In fact it lies within the storage tank.

Another experimental system investigated uses a larger unit which has been lent by the E.R.A. This has been installed in a board substation which, due to the lack of natural ventilation runs at a temperature considerably higher than is healthy for the transformer (120° F). The heat thus provided from the transformer is pumped through a wall to provide 100 gallons a day of high temperature washing up water for an adjoining cafe. This case provides what may well be regarded as an optimum situation for a heat pump, for, as the winter loading of the substation increases so also does the quantity of heat available, and at the same time the internal requirement of the cafe for heat is liable to increase. There is also the point that the cooling effect (a drop of 30° F in ambient temperature) will prevent serious overheating of the transformer and thus prolong its useful life.

Work is also being carried out in the workshops of the Board on the construction of an air-conditioning unit. This, however, was in its early stages when we saw it. Our thanks are due to Mr McLean for allowing us to see some of the work he is undertaking.

Figs. 2 and 3. Lagged tank containing compressor unit in experimental domestic installation at Bristol with the cold side of one of the domestic installations



around the trade

by Peregrin

NOT so long ago some overworked trades adopted, unwillingly one hopes, the policy of shutting shop periodically, while they tackled the ever mounting arrears. Shoe repairers would display a warning—"No more repairs taken in this month." To have a watch repaired one had to be content with a place on the waiting list, and dry cleaners also closed the door for a time when they were full up to the ceiling.

The necessity for this practice seems to have afflicted the electrical trade. One well-known firm, famed for the quality of its electrical fires and high standard of service, has announced that no more fires will be accepted for overhaul until next Spring. On enquiry it appears that the firm will still endeavour to give the minimum service necessary to put a fire into safe and efficient working order, but anything beyond that minimum must wait until next year.

This prompted me to make enquiries in the retail trade, and I find there a similar state of affairs. The approach of winter has produced an unusually fine crop of fires needing repair, and although it is not unduly difficult to obtain the spare parts, it is almost impossible to find time to fit them. One dealer who does a big business in appliance repairs, though not yet refusing orders is encouraging customers to keep their fires at home until he is ready to collect them for repair. As he put it—if the thing has to remain idle for a month or so, why not let the owner take care of it, instead of it collecting dust in the repair shop.

There are one or two reasons for this present glut. One is our old friend purchase tax. Before the war a reasonably good fire could be bought for 12s. 6d., a price which did not cause a financial crisis if the fire had to be scrapped and replaced, in a year or two. Nowadays a very modest effort costs £2. 12s. 6d., and at that figure the customer not only continues to use the fire beyond its normal life span, but expects it to be made as good as new when it fails. Another reason is the increasing public awareness of the safety guard regulation. Now that electric fire guards are "legal," a fire which caused no anxiety a month or so ago is viewed with slight suspicion, and a visit to the electrical retailer is indicated. It is natural then to ask for the fire to be generally overhauled "while you are about it," and so the repairs accumulate.

Shallow Switches

An outstanding improvement in installation sundries since the war is in lighting switches, made possible by the development of the micro switch. Switches seem to become thinner, daintier and quieter every time a new catalogue is issued, and it is all to the good. A particularly welcome addition is the new plaster depth switch. Wholesalers have a vast and varied stock of these attractive switches in cream and brown, and most contractors are abandoning the old type sunk switch, which demanded so much cutting away and refinishing. In fact, plaster depth switches are no more trouble to install in a new building than surface tumbler switches and blocks.

But, as usual, there are sighs in certain quarters and murmurs of disapproval. For it is said that here is yet another gift to the do-it-yourself enthusiast, and it would certainly seem to be so. The amateur usually shies at fixing sunk switches, especially after he has tried one and demolished most of the wall in doing so. But now, he simply cuts a neat square out of the plaster, fixes the box and adjusts the switch and plate accordingly. If he uses a pressed steel box instead of a wooden one the required depth is even less, though "Megohm" will no doubt hasten to tell me that metal boxes must not be used unless earthed.

I asked one electrical contractor and retailer if he was using many of the new type of switch. His reply was emphatic. He declared he could not get enough to use them himself, as he was selling them all to handymen as fast as they were delivered. That may be an overstatement, but it does seem as if every development in installation equipment makes wiring more simple and demanding less skill. "Consumer units" are a good example. Well, if these aids to simplification help to bring down the cost of installation work, we cannot have too many of them. No sensible contractor will dispute that.

Heat Pump Future

The domestic heat pump is hailed as something strikingly new, and so it is, but the principle is not. It was being produced in quantity two years ago in the United States, and a hundred years before that Lord Kelvin was demonstrating something very similar. In the United States the novelty period is over and the heat pump is rapidly falling into line with the refrigerator, the air conditioner and other domestic electrical aids. At the moment the price is an obstacle. A small model with a 2 h.p. unit costs about £700 a sum which would provide a lot of heat by more old-fashioned methods. It is claimed, of course, that the heat energy provided is several times the energy consumption of the pump unit, and one manufacturer is rash enough to assert that with a heat pump you get your heat for nothing, as you are merely purloining heat which already is there for the taking. Even the extremely high efficiency which all these claims indicate does not offset the present high initial cost.

However, there is no doubt that the heat pump, for industrial use, is on the way in, and it is only a matter of time for it to become a regular domestic appliance. Electrical retailers and wholesalers should therefore begin to become acquainted with it. There is a big future for it, and indeed it may eventually have a considerable influence on the sale of both heating appliances and refrigerators. It may be wise, however, to stress the heating value of the heat pump at first, rather than the dual purpose, which is being boosted in America. In this country, which seldom enjoys high temperatures for long periods, space cooling is not much of a problem, but there is quite an attraction about a device which can be made to heat the kitchen or cool the larder, and which does not take up much indoor space, nor consume much electricity.

Coal Firing of Gas Turbines

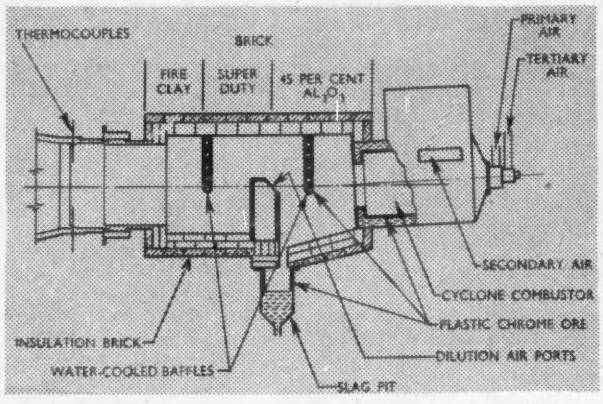
CANADIAN EXPERIMENTS DESCRIBED AT INSTITUTION OF MECHANICAL ENGINEERS

IN 1950, Prof. Donald L. Mordell, of McGill University, and his colleagues made fairly detailed studies which suggested that an exhaust-heated coal fired engine of the gas turbine type would offer useful possibilities for the generation of electrical power (1,000-1,500 kW) and which might also be used for locomotive work. The Department of Mines and Technical Surveys of the Canadian Government, which has as one of its responsibilities the development of new uses for coal, thought this was a project which they could justifiably support, and a contract was awarded to McGill University for the design and construction of an experimental machine. This has now been carried out, and details of the plant were given in a paper presented last Friday to the Institution of Mechanical Engineers by Prof. Mordell himself.

Basically the machine was founded on an existing aircraft engine and it was considered advisable to derate this to gain longer life. The speed was restricted to a maximum of 13,600 r.p.m. with a maximum temperature of 1,340° F compared with the original design speed of 14,500 r.p.m. and a temperature of 1,520° F. This cut down the output from about 800 h.p. (oil) to 500 h.p. (with coal).

Combustion System

As can be seen from the cycle diagram there are two heat exchangers involved and no products of combustion pass through the turbine. Much time and trouble was involved in the design of the "hot" exchanger which has to operate at rather high temperatures. It was constructed as a mixed counter-flow and parallel-flow unit. The tube material was Nimonic 75 and stainless and heat resisting steels had to be used. The "cold" exchanger was quite conventional in every way.



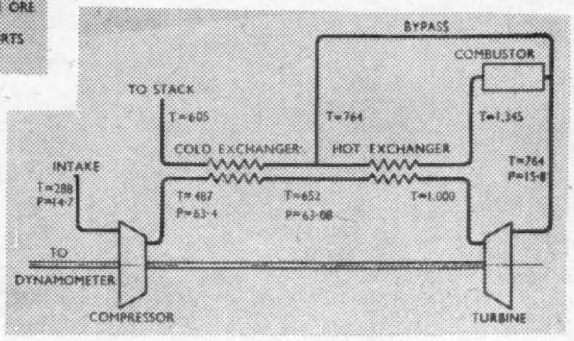
The decision was made to use a cyclone slagging furnace. The main combustion chamber was a cylindrical vessel 2 ft in diameter lined with a castable refractory and watercooled. Coal, previously crushed to pass through an $\frac{1}{8}$ in. diameter screen was injected with about its own mass of air at one end of the chamber with a swirling motion. Secondary air was fed tangentially to the chamber and the coal particles were thrown out to the walls by centrifugal force. The coal adhered to the wall, was scrubbed by the air-stream and burned quickly and completely. Owing to the high temperature, the ash fused as it formed on the wall and the molten slag drained out through the furnace and was continuously collected. The combustion gases passed through a throat at the end of the furnace into a secondary chamber, where there were two baffles arranged vertically. These served the dual purpose of catching some of the ash which might otherwise have been blown out and of shielding the heat exchanger from the intense radiation in the hot primary zone. Excess air, not required for combustion, was fed into the hot gases in the wake of these baffles, having first been used as cooling air to cool the brickwork of the secondary mixing chamber. The whole furnace assembly was mounted on runners to permit freedom for expansion.

Initial Testing

By the end of October 1953 the plant was essentially complete, and was motored for the first time on 5th November. It ran under its own power on 20th November, 1953, with oil as a fuel, and on the 27th of the same month was run on coal. Several teething troubles were found, mostly in connection with expansion problems in the manifolds. By 30th April eight runs had taken place, and a new Dart engine became available and was installed in place of the original gas turbine. Slag removal also caused difficulty due to the low ash content of the fuel and also because of the light loading. A trial run, despite slagging troubles, was, however, carried out, lasting for 57 hours the output varying up to 250 h.p. and turbine-inlet temperatures up to 1,340° F. At the conclusion of this test a total of 114 hours had been run, including nine starts and stops, and it was felt that the second phase of activities, namely, preliminary proving tests of the plant, had been accomplished.

The third phase comprising development to ensure continuous slag removal from the furnace, satisfactory coal-feeding and long-period endurance running at incremental powers was now in progress.

Left is a sectional view of the first experimental furnace. Below is a schematic diagram to illustrate the thermodynamic cycle



Final conclusions concerning the practical possibilities of the exhaust-heated cycle must await the results of protracted operation, but from the work done so far a number of important points were obvious.

It had been demonstrated that coal could be used as a fuel, and in spite of the large capacity of the heat exchangers, the plant could be started from cold reasonably quickly. It could accept or shed load quite fast, because the load could be changed by altering turbine speed and air flow without much change in tube-temperature and therefore in stored heat. In emergency it could readily be shut down and a blow-off valve controlled by an overspeed governor, and with a manual override, had been used on the compressor delivery and this system had proved satisfactory.

It was felt that the exhaust-heated unit was in no way temperamental, did not require careful nursing or maintenance, and had already demonstrated its ability to run even with combustion conditions far below the standards which it was known from test rigs could be achieved.

Acknowledgments were made to the assistance which had been given to this project by Lord Hives, Chairman of Rolls-Royce Ltd., to Sir Harold Roxbee-Cox, to Canadian Vickers, who were concerned in the design and construction of the hot heat exchanger and to Babcock and Wilcox Ltd., Alliance, who helped in the original design of the cyclone furnace.

DISCUSSION

PROF. MORDELL said that since the paper was written a great many improvements had been made. They were now well aware of the penalties of too close baffling. The pressure loss on the air side at the hot heat exchanger was a great deal larger than they had expected, and the heat transfer in the parallel flow section was not nearly so effective as it should be. They did not believe that the complication of parallel flow was worth while. Everyone who had seen the plant running was convinced that potentially the exhaust-heated machine was a type of gas turbine which would stand up to very rugged service and complete lack of attention. Its most obvious application was for locomotive propulsion, and any gas turbine which would be at the mercy of the average Canadian railwayman must need no attention save what could be given with a sledgehammer.

SIR HAROLD ROXBEE COX, formerly Chief Scientist, Ministry of Fuel and Power, said that the staff of that division of the Ministry had been intensely interested in the author's work since its inception, feeling that the immense quantities of coal in Canada and (despite occasional impressions to the contrary) in this country made it highly desirable to investigate more efficient methods of using it.

MR R. J. WELSH expressed the conviction that the author's cycle was completely feasible technically, but said that whether it was economically feasible had yet to be established. Those who had investigated this type of cycle in this country had found that the cost was prohibitive, though admittedly their heat exchangers had not been designed so intelligently as the author's.

DR J. S. CLARKE, commenting on the use of a slagging furnace said that from his experience in the furnace industry it was not possible, when one had a furnace which was slagging, to keep the slagging hole in good shape; it simply melted away. He was inclined to favour the non-slagging type.

MR R. G. VOYSEY (Ministry of Fuel and Power) said that locomotive costs were not very important in the whole costs of running a railway, so that the choice of prime mover was governed as much by convenience, availability and service qualities as by thermodynamic efficiency. The economy of the existing steam locomotive was only good when it was not in use. It cost a great deal to run, the fuel costs alone greatly exceeding the capital charges. When account was also taken of its high maintenance it would be seen that a reliable locomotive with high availability was worth several times the cost of the coal-fired steam locomotive. The locomotive was an ideal application for the gas turbine, because, unlike power station operation, the total running life was small and the individual running times were smaller.

The author's use of the cyclone furnace was interesting. When they started to consider their gas turbine locomotive project at the Ministry they had felt that the cyclone was the best type for a locomotive, but they had gone away from that view. While they had not had any running yet on their coal burning locomotive turbine, and were unlikely to do so for a year, comparable tests on an air heater with a dry burning chamber had been made and runs totalling over 500 hours had been made without trouble.

MR I. G. BOWEN (Shell Petroleum Co.) dealing with ash deposition and corrosion, said that the ash trapped in the slagging combustion chamber was only part of the total ash, and that which was carried over might give trouble, in particular due to the sodium and calcium. The amount of carry-over into the cold heat exchanger was important, because the cycle used was particularly sensitive to loss of area on the low pressure side and any deposits there might seriously affect the efficiency of the turbine. He was surprised by the lack of reference to the problem of corrosion, because the combustion gases were coming in at over 1000° C, and any sodium which came through, especially in the form of sodium sulphate, might attack the Nimonic 75 which the author used.

MR J. O. N. LAWRENCE (Joseph Lucas Ltd.) said they had found that when aircraft gas turbines were coupled together with industrial units they had a longer life than the industrial unit.

MR L. G. COPESTAKE said it was encouraging to find that the author's unit worked on crushed coal. The British unit used pulverised coal. It was very difficult to pulverise coal on a locomotive. In this country, with short runs and coal everywhere, it could be pulverised in fixed installations, but where there were long runs it was easier to crush the coal to pea size than to pulverise it.

MR W. V. BATTCOCK (B.C.U.R.A.), commenting on the use of a slagging combustion system, said at first he had imagined that a dry burning system would be better, but with this the problem of separating the ash, which would be in the form of fine dust, from the gas before discharging the gas through the stack of the locomotive would be enormous. On power stations gas-cleaning equipments formed a big proportion of the size of the plant, and with the exhaust-heated cycle the volume of gas for a given power output was at least six times greater than that of a boiler, so that a combustion system which made it possible to get a high proportion of the ash out as slag was well worth considering.

MR E. H. WARNE suggested that if, instead of coal, oil was used and burned between the compressor and turbine it would be possible to use the heat exchanger for generation and show a great saving in the cost of operation.

MR M. J. I. KEMPER remarked that in Canadian conditions the author could find a very good use for his heat loss in heating the train. It would probably not make a great deal of difference whether a slagging combustion chamber or a dry burning chamber was used. If the ash went through dry there should not be much trouble with sodium corrosion.

PROF. MORDELL, in reply, dealt with the economics of the use of his cycle for locomotives and said that a standard 2,250 h.p. diesel-electric locomotive equipped for passenger service cost $265,000 in Montreal. Careful study showed that a coal-burning gas turbine locomotive, produced as one of a batch, would cost $345,000, but the saving in fuel cost due to burning run-of-mine Nova Scotia coal, the fact that less lubricating oil was used and also that a separate train-heating boiler would not be necessary, should mean a total saving in passenger train service of $25,000 a year, so that the cost would be recovered in four years. With the gas turbine the obvious source of maintenance was the lining of the furnace, but the money expended on the maintenance of the diesel engine (not the whole locomotive) in a year would pay for 25 furnace linings. Moreover, whereas when the diesels were new everything was fine, the curve of diesel engine maintenance against time was now going rapidly upwards in the United States.

Transatlantic Telephone Cable

U.S., CANADA AND GT. BRITAIN TO BE LINKED BY 1956

BARRING unforeseen and unexpected delays, 1956 should see the completion of the first transatlantic telephone connection via submarine cable. The venture, originally envisaged some years before the war, has been made practicable by the close co-operation between the operating authorities on both sides of the Atlantic and by the interchange of information on new techniques, material and equipment. An account of the scheme was given last week in a paper jointly presented to the Institution of Electrical Engineers and the American Institute of Electrical Engineers. Mervin J. Kelly, PH.D., D.ENG., D.SC., LL.D., Sir Gordon Radley, C.B.E., PH.D.(ENG.)., M.I.E.E., G. W. Gilman, M.S., M.AMER.I.E.E., and R. J. Halsey, B.SC.(ENG.), M.I.E.E., collaborated in preparation of this paper which is entitled "A Transatlantic Telephone Cable."

The two cables to be used on the main crossing will each be nearly 2,000 nautical miles long, containing no less than 52 repeaters and will be laid at depths of up to 2,000 fathoms. In contrast the longest submarine telephone cable so far is that recently laid between Scotland and Norway; this is 300 nautical miles long and contains 7 repeaters. From Oban in Scotland the twin cables are to take an almost direct route to Clarenville, Newfoundland. Signals received will then be relayed by means of a single cable, which initially runs overland for 60 odd miles and then is laid in the sea for a further 274 nautical miles before arriving at Sydney Mines, in Nova Scotia. The project will then be completed. Joint engineering responsibility is shared between the American Telegraph and Telephone Co., and the British Post Office.

Oban—Clarenville Section

The first part of the scheme will be to lay the two cables from Scotland to Newfoundland. In each of these cables, of the coaxial type, provision is being made for 36 carrier telephone circuits to be accommodated in addition to the power supply to the repeaters which are to be situated at distances 37 nautical miles apart along the whole cable length. The central deep sea portion, of 1,500 nautical miles length, is to be laid in one piece and complete with repeaters will be loaded into the H.M.T.S. *Monarch*, which has been adapted to suit the task. The total weight of this section of the cable is approximately 5,000 tons. Four different types of covering have been evolved for the cable, to suit the conditions expected at various ocean depths. The basic cable comprises a central conductor surrounded by three copper tapes which are insulated from the six return tapes by polythene. A layer of overlapped teredo copper tape and cutched jute is then surrounded by the armour covering. This varies from high tensile steel wires for cables to be laid in depths of 700 fathoms and over, to a double layer of 0·3 in. dia. galvanised wires for the shore-ends.

Care in Repeater Design

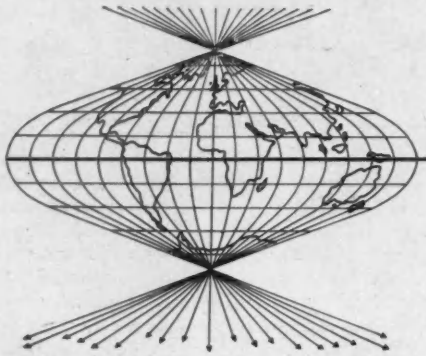
In the design of the repeaters lies the secret of success of the whole project. To obviate the necessity for making joints at sea, it is desirable that the repeater housing should be approximately the same diameter and flexibility as the cable. Unfortunately, this has not proved possible but the American design, which is to be used, gives a repeater housing of 2·8 in. diameter compared with the 1⅛ in. of the cable. To obtain the flexibility necessary to allow them to be passed readily over the cable drum and bow sheaves, the repeaters are to be divided up into a number of elements each contained within a methyl-methacrylate cylinder. Successive units are to be connected by a spring assembly to form an articulated system.

Great trouble has been taken to obtain the fine quality electronic and other components to be housed in these repeaters. The three-stage pentode amplifiers contain 54 components apart from valves and high-voltage capacitors. Prior to selection all equipment has been subjected to exhaustive investigation to ensure a working life of 20 years or more. Repeaters are series-connected and fed from both ends of cable. Initially, 3,900 V will be required, this may be raised eventually to offset any deterioration in valve emission. Only half the nominal voltage appears on the cable and a sea-return is provided. Testing arrangements are being provided to determine performance and condition of individual repeaters by means of measurements made from the shore ends. Since the pressure at the depth of 2,000 fathoms is expected to be of the order of 3½ tons/sq in. a system of 3 seals in series has been adopted to prevent the ingress of sea-water.

Clarenville—Sydney Mines Cable

The cable from Newfoundland to Nova Scotia is of the same basic type as those for the main route, however, there are certain differences. Provision has been made for the inclusion of up to 60 telephone carrier circuits on this part of the system, of these, 36 will be used for the main programme, 12 are to be used for local services between Newfoundland and Canada and the last 12 will remain spare for the present. The first part of the cable, which runs overland, contains two repeaters which are of the same design as those used undersea. Since on this part of the route only a single cable is to be laid, repeaters are of the both-way type. Much experience has been gained in this country by the Post Office in the design, construction and operation of this type of repeater and therefore the British design is being used. The electrical equipment is mounted in an inner sealed cylinder 4 ft 2 in. long by 7¼ in. dia., filled with dry nitrogen. This is mounted between brazed-in bulkheads in a pressure-resisting outer housing which is about 9 ft long by 10½ in. dia. Polythene mouldings integral with the cable dielectric are shrunk on to castellated bosses to form the glands and cable-armouring wires are made off under clamps, which transfer the laying tension to the housing. The repeaters contain two 3-stage pentode amplifiers working in opposite directions, and are spaced at distances of 20 nautical miles along the cable-route. Testing facilities have been provided as in the other cables; in this case frequency translation is possible and therefore accurate measurement of each repeater output is possible.

The arrangements for feeding power to the repeaters on the two sections are generally similar and involve the use of constant current generators at both terminal stations, series-aiding and arranged so that one end controls the value of the line current. To ensure power, supplies for the cables power feed is obtained from a.c./d.c./a.c. machines so that in the event of failure of the incoming supply, 130 V batteries can feed the d.c. machine and if failure is prolonged standby diesel generators take over.



OVERSEAS NEWS

A SUMMARY OF IMPORTANT EVENTS

CANADA

O.H. Line Unwanted

The application by the British Columbia Electric Co., for permission to construct a $1 million substation has been rejected by Saanich Council. The rejection was made because the company planned to erect a 135 kV overhead transmission line through residential areas to supply certain parts of the city. Now, the local ratepayers are being asked to decide in a referendum next month, whether they favour the erection of this high voltage overhead line. At its recent meeting, the Council also decided to ask the B.C. Cabinet to instruct the Public Utilities Commission to determine the cost of placing a power line underground, and the possibility of alternate overhead routes. Many councillors objected to the proposed o.h. line on the grounds that it would devalue property. The company's claim that it would cost $1 million to place the line underground was also doubted.

Another B.C. Project

Work on the British Columbia Electric Co.'s Cheakamus River hydro-electric project will start as soon as a licence has been granted by the Provincial Government, Mr D. Grauer, president of the company, has stated. It is expected that the project will take 32 months to complete and will cost $25 millions. Under the scheme, waters of the Cheakamus River will be utilised at a point 14 miles north west of Squamish. A 200 ft long dam is to be constructed together with a seven-mile-long tunnel which will pass water to a remote-controlled power station. In this it is proposed to install two 95,000 h.p. generators operating on a 900 ft head. Mr Grauer has said that he expects contracts for the scheme will be placed within a few weeks. Despite the rugged mountainous country between the project and Vancouver, the problem of transmitting the power generated will be less difficult than with other of the company's projects, he stated. A new 230 kV transmission line, 14 miles in length, will connect with an existing line at Cheekye, above Squamish.

Niagara Tribute

Tribute to the work of the contractors and manufacturers of equipment (including the English Electric Co.) concerned in the Sir Adam Beck-Niagara generating station No. 2, was paid by Mr Robert Saunders, chairman of the Hydro-Electric Power Commission of Ontario, at the recent official ceremony. The full text of his speech, to hand, shows that he also referred to the "wonderful co-operation received from Mr Maxwell Buist, export director of the British Electrical and Allied Manufacturers Association." Mr Saunders has recently visited Britain several times and has quickly made many firm friends here.

U.S.A.

Another Contract

The English Electric Co. Ltd. has been awarded a contract for two water turbines for the Table Rock dam project, Arkansas. Their price was $1,066,662 which was $143,000, or 11·82%, lower than the nearest American tender, that of the Newport News Shipbuilding and Drydock Co. The Table Rock project is being constructed by the U.S. Army Corps of Engineers on the White River on the Missouri-Arkansas border. The tenders were opened on 29 Sept., but the award of the contract has awaited a decision by the Secretary of Defence (Mr Wilson) as to whether the "Buy American" Act would make it necessary to accept the bid of an American rather than a British concern. The Table Rock contract has been regarded as a test of the reaction of the Eisenhower Administration to the election this week of the "freer trade" Democratic Congress. The two English Electric machines will be 68,000 h.p., 128·6 r.p.m. vertical shaft, single runner, Francis type water turbines, to operate at heads of 134 to 228 ft, the nominal head being 190 ft. At 134 ft head the output of each turbine will be 44,000 h.p. and at 228 ft 83,200 h.p. Delivery will commence in August 1956 and the equipment is due for completion by September 1957.

ARGENTINE

H.E. Development

Work has started on the construction of the second hydro-electric plant at El Nihuil Falls on the Atuel river in Mendoza Province, Argentina. The new plant will have an installed capacity of 85,000 kW and power will be conveyed over 224 km of high-tension aluminium transmission lines to the towns of Mendoza and San Rafael, for which tenders are being sought, as we noted in our 21 Oct. issue.

Furthermore, work is to start soon on the Ipizca dam at Ancasti, Province of Catamarca, thus implementing part of the electrification plan for that province. The cost will be about pesos 16 millions. Tenders are to be called also for the building of another dam in La Canada de Carpinteria, Catamarca Province, at a cost of pesos 9 millions.

The second Argentine five year plan calls for the building of three dams in this region, to be completed by 1958. These dams will also serve to irrigate 8,000 hectares of arable land and 200,000 hectares of grazing land.

EUROPE

Power Export

A substantial increase in the interchange of electric power between France and Spain has been approved by the two governments. This new agreement provides for export of power between the Fenosa-Sil hydro-electric group in Spain and Electricité de France under which the former will supply up to 100 million kW to France between 15 Oct. and 15 May, which the French system will reciprocate with an equivalent amount during the summer months.

Power Needs

It has been estimated that the material requirements of electric power in Italy will rise from the present 32½ million units per annum to about 50 millions by 1960. To cover this demand will necessitate a programme of construction of generating plants amounting to about 250 million lire a year. At a recent meeting of the Council of Ministers, the possibility of raising this sum from private capital was discussed, as was also the question of increasing electricity charges.

Lisbon's Underground

For the purpose of carrying out the first section of the proposed underground railway for Lisbon, the Metropolitano de Lisboa S.A.R.L. has been authorised to contract a loan of 150 million escudos, guaranteed by the Portuguese Government. It is understood that tenders have

been invited from a selected list of firms for the construction of this first phase of the project. This first phase will comprise a straight stretch of 1·07 kilometres is length running north-west under one of Lisbon's widest theatre-lined avenues from the Restauradores to the Praca Marques de Pombal, with one intermediary station, and then dividing into two branches, each with four stations, one in a north-west direction for 2·6 kilometres to Sete Rios and one in a northerly direction for 2·6 kilometres to Entre Campos, near the airport. In addition there will be a short branch leading to workshops. Most of the tunnels will be at relatively shallow depth and dug by the "cut-and-cover" method, apart from the stretch running beneath the Edward VII Park, where the station will be served by escalators.

IRAQ

Indecision

The urgent need for a clarification of the power situation in Baghdad was emphasised by Sir Kinahan Cornwallis, chairman of the Baghdad Light and Power Co. at the meeting of the company recently. He explained that in July, 1953, a Ministerial Order was passed by the Cabinet, for the nationalisation of the undertaking. Later the Cabinet resigned without implementing the Order, and its successor has taken no action. He stressed that the electrical power demand in Baghdad was so insistent that new plant would be required before very long and if the government decided not to nationalise the undertaking the company would have to find a way to provide the plant. The company's power house now contains 41,000 kW of generating plant.

INDIA

Time Limit Fixed

The time given to the State Governments of India for the setting up of State Electricity Boards is not to be extended beyond 31 Mar., 1955. Stating this, Mr Jaisukhlal Hathi, Deputy Minister for Irrigation and Power, indicated that the State Governments had given different reasons for not having set up their Boards. Some felt that an independent electricity board was unnecessary, and others had raised financial and administrative difficulties. Madras and Mysore were among the States which considered the setting up of boards unnecessary.

Industrial Expansion

The selection of a competent firm of consulting engineers to offer advice is an essential preliminary to the rapid industrialisation of India, according to the newly formed National Industrial Development Corporation which recently held its first meeting in New Delhi. The board of the Corporation suggests that a firm of international reputation be invited to open in India with, if necessary, a retainer fee in the initial stages. The board also believes that the Corporation should have a nucleus of three or four general engineers of wide experience who could advise the Corporation not only on the technical problems coming before them but also on the choice of suitable consulting and design engineers for preparing blue-prints of specific projects to be undertaken by the Corporation. The main objects of the Corporation, as described in its Memorandum of Association, are the promotion and establishment of industries for the manufacture and production of plant, machinery, implements and goods of any description likely to promote industrial development of India.

A provisional list of industries on which the Corporation could undertake useful investigation in due course includes: (*a*) the manufacture of machinery and equipment for a number of industries including jute, cotton, textiles, sugar, paper, cement, chemicals, printing, mining, construction and mechanical conveying; (*b*) ferro-alloys, ferro-manganese, ferro-chrome; (*c*) aluminium; (d) copper, zinc and other non-ferrous metals; and (*e*) diesel and marine engines, locomotives and generators.

AUSTRALIA

Eildon Operating Again

As the first stage in increasing the capacity and power output of the Eildon Weir, the State Electricity Commission of Victoria, has now put back into service the two generators which have been rebuilt—they were taken out of service in August 1953. These sets are providing 15,000 kW for up to 18 hours per day, we understand. The operation of these units has been made possible by increasing the storage capacity of the reservoir. Originally its capacity was 306,000 acre ft, but under the scheme begun about 3 years ago, a new dam will ultimately increase that figure to 2,750,000 acre ft. Already the capacity is over 460,000 acre ft, and the old 140 ft high dam has been submerged. A new dam is being built, 260 ft high and 3,000 ft long, to raise the water level 127 ft. Already this earth and rock filled dam is 170 ft above the river bed. A new power station is to be constructed to house two 60 MW turbo-generators which are on order, scheduled for operation in 1956. Detailed design of the power station was undertaken by Balfour, Beatty Co. Ltd., the consulting engineers. The civil construction work is being carried out by the Utah Construction Co., an American concern.

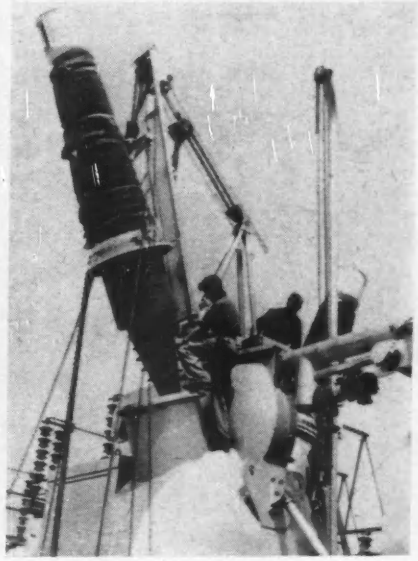
Subsidy for Queensland ?

An appeal for a State Government subsidy of electrification in South East Queensland was made in the State Parliament, recently. A member said that when the Southern Electricity Authority extended into northern N.S.W. consumers there received great benefit from the subsidy. He declared that when the undertaking was the former City Electric Light Co. the Government's excuse was that it was not possible to subsidise a private company. But now the undertaking had been taken over by the S.E.A. and he suggested that the time had come for the Government to subsidise rural electrification in the country. It should be explained that under a 1939 agreement, the former City Electric Light Co. had an exclusive right of supply throughout an area of approximately 10,000 sq miles in S.E. Queensland, together with provision for the acquisition of electricity authorities then existing in the area. The company also obtained a franchise for the Shire of Tweed, in Northern N.S.W.

NEW ZEALAND

Power Shortage

The power situation in South Island, New Zealand, is still very serious. A short time ago all supply authorities were ordered to cut their bulk supply demands by 20%—doubling the reduction that had been in force for some weeks. This has intensified the power restrictions in operation since July.



One of the units of a B.T.H. 220 kV, 5,000 MVA three-phase "Shuntarc" oil circuit-breaker being erected at Yallourn power station, Victoria, Australia. A total of sixteen similar circuit-breakers has been ordered by the State Electricity Commission of Victoria from the British Thomson-Houston Co., Ltd., for installation at Yallourn. Our illustration alongside is one of the first six equipments being erected on site. It may be recalled that extensive proving tests were carried out on the B.T.H. lenticular-tank "Shuntarc" circuit-breaker at the Fontenay Testing Station of Electricité de France including a series of tests to cover short-circuit duty, line dropping, and transformer and reactor switching

Personalities IN THE INDUSTRY

In the Plymouth district of the South Western Electricity Board **Mr F. Isaac,** A.M.I.E.E. has been appointed district engineer, and **Mr F. A. Hitchcock** is now designated as deputy to Mr Norman Axford, the district manager. Mr Isaac has been commercial engineer in the Plymouth district for the past six years and was formerly deputy electrical engineer with the Plympton Council Electricity Department. Mr Hitchcock has been industrial power engineer with the Board for three years, and has travelled widely in the area giving specialist advice on industrial and commercial power problems.

Mr G. A. Rendle, B.SC., M.I.E.E., has been appointed to the board of British Insulated Callender's Construction Co., Ltd. He becomes manager (cable contracts) in succession to **Mr C. H. Frankland,** M.I.E.E., who, as we reported last week, while remaining a director of B.I.C. Construction Co., Ltd, has undertaken special duties at the Trafford Park works of British Insulated Callender's (Submarine Cables) Ltd. It is also announced that **Mr C. Kibblewhite,** M.I.E.E., has also been appointed to the board of B.I.C. Construction Co., Ltd, as an executive director.

At present maintenance engineer (electrical) at Rye House generating station, Eastern Division, B.E.A., **Mr J. H. W. Cope** has been appointed deputy station superintendent at the Division's Goldington power station, with effect from 1 Jan, 1955. Mr Cope commenced his service with the industry with the North Metropolitan Electric Power Supply Co. in 1924, being promoted to shift charge engineer at Brimsdown "B" power station in 1947. He was appointed to his present post at Rye House in Sept. 1951, when the station was first commissioned.

Mr G. A. J. Housden has been appointed sales manager of the Water Heating Department of Simplex Electric Co., Ltd. Educated at King's College School, Wimbledon, he completed a five-year student apprenticeship with the Shropshire, Worcestershire and Staffordshire Electric Power Co., and studied at Birmingham Central Technical College. After war service he returned to the S.W. and S. Electric Power Co., and in 1946 went to Leominster as assistant to the district manager. Mr Housden joined Simplex in 1949 as sales representative in the Midland area, becoming Creda sales engineer early this year, covering the Midlands area.

Mr T. D. Shillcock has been appointed Creda sales engineer for the Midlands area in succession to Mr G. A. J. Housden. Educated at Rugby School, Mr Shillcock received commercial training in the electrical wholesale trade. For some years he represented the Simplex Electric Co., Ltd., in the Home Counties. He was commissioned in the Royal Corps of Signals in 1940 and at present holds the rank of major in a Territorial Unit. Returning to the company in 1946 he represented Simplex in the East Midlands becoming Creda sales engineer early this year in the same area. **Mr R. Caffelle** has been appointed Creda sales engineer in succession to Mr T. D. Shillcock. Mr Caffelle was educated at Bablake School, Coventry, since when he has been with the Coventry Corporation Electricity Department and the East Midlands Electricity Board, where he held the position of senior assistant (development).

District commercial engineer at Wednesbury, to the Midlands Electricity Board since February last, **Mr F. Picken,** A.M.I.E.E., is taking up a similar post for the Rotherham/Mexborough district, No. 3 sub-area, to the Yorkshire Electricity Board from 1 Dec. next. Prior to 1948 Mr Picken held various positions with the West Midlands Joint Electricity Authority, engaged on the Shropshire distribution scheme. From 1948 until early this year he was district commercial engineer, Wellington district, Shropshire and Hereford sub-area of the Midlands Electricity Board.

Recently appointed manager of the Leicester branch office of British Insulated Callender's Cables Ltd., is **Mr E. S. Mackay,** who has been Midlands representative for the company. Mr Mackay served an apprenticeship with Yarrow and Co., Ltd, and afterwards continued his training at Glasgow Technical College. He became Scottish representative of the Macintosh Cable Co. in 1925 and for the next 11 years represented that concern in various areas, including Yorkshire, Lincs, Northants and S.E. England. When the company was taken over by British Insulated Cables Ltd. in 1936 he represented B.I.C. Ltd in the Midlands, and after the merger in 1945 with Callender's Cable and Construction Co. to form the present B.I.C.C., he continued to act in that capacity.

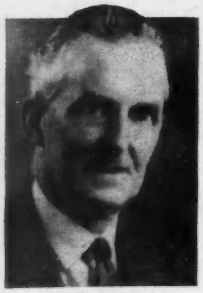
Station superintendent at Portsmouth generating station, Southern Division, B.E.A., **Mr A. D. Matthews,** A.M.I.E.E., has been appointed to a similar position at the Division's new Marchwood power station. Educated at Portsmouth Grammar School, and Portsmouth and Salford Technical Colleges, he gained early experience with the Lancashire Dynamo and Motor Co., but in 1928 joined the Turbine Section of the British Thomson-Houston Co., Ltd., as assistant engineer. He went to the Portsmouth Corporation undertaking in 1931 as shift engineer, staying there till 1939. After war service he became deputy station superintendent at Belfast, in 1946, and held a similar post at Coventry from 1948 to 1949 before going to Portsmouth.

In the North West, Merseyside and North Wales Division of the B.E.A. **Mr A. M. Murray** has been appointed senior assistant secretary, administration); **Mr N. Wells,** A.C.I.S., is appointed senior assistant accountant (capital), **Mr J. Anderson,** C.A., becomes senior assistant accountant (cost of production and revenue accounts), and **Mr J. J. Thomson,** A.S.A.A., A.I.M.T.A., is senior assistant accountant (cash, superannuation and mechanised accounting).

Mr G. A. Rendle

Mr C. Kibblewhite

Mr G. A. J. Housden



Mr E. S. Mackay

It is announced that the President and the Council of the Royal Society have awarded the Copley Medal to **Sir Edmund Whittaker,** F.R.S., for his distinguished contributions to both pure and applied mathematics and to theoretical physics, and the Hughes Medal to **Mr M. Ryle,** F.R.S., for his distinguished and original experimental researches in radio astronomy.

Enfield Cables Ltd. announce the following appointments: **Mr J. G. Jackson,** manager of the Newcastle branch for the past ten years, has been appointed manager of the Glasgow branch; **Mr F. R. Mackenzie,** manager of the Southampton branch for the past three years, has been appointed manager of the Newcastle branch; **Mr W. F. Lawrence,** who has been on the London Sales Staff for the past four years, has been appointed manager of the Southampton branch; and finally, **Mr H. Dennis,** A.M.I.E.E., has been appointed manager of the Manchester branch. Mr Dennis has spent the greater part of his career with the English Electric Co. Ltd., at Stafford and Liverpool and was latterly manager of the Manchester office of the Brush Electrical Engineering Co. Ltd.

From the Brush Electrical Engineering Co., Ltd., we learn that **Mr R. S. D. Bagnall** has been released, at his own request, from his appointment as home sales director with effect from 31 Oct., 1954. **Mr L. C. W. Turner,** sales director, has taken over the duties and responsibilities formerly associated with Mr Bagnall, with effect from 1 Nov.

Professor Watson-Munro, Professor of Physics at Victoria College, Wellington, New Zealand, has been appointed chief of research to the Australian Atomic Energy Commission and will begin his new duties early next year. He will direct the £A5,500,000 programme recently approved by the Commonwealth Government. During much of the war Dr Watson-Munro directed a radio research laboratory in Wellington which was established by the New Zealand Department of Scientific and Industrial Research for the solution of radio, and especially radar, problems which were of interest to the New Zealand services.

Mr F. J. Tucker, assistant district engineer at Guisborough with the North Eastern Electricity Board has retired. He has been associated with the electrical industry in the Guisborough area for 38 years.

OBITUARY

Lord Colgrain, chairman of the Telegraph Construction and Maintenance Co., and of other companies, died on 3 Nov. aged 88. He had been a director of T.C. and M. for over 57 years, and was chairman for 22 years. He had guided the company's affairs with distinction.

Mr W. Fitzsimmons, founder of the Belfast electrical contracting business of W. K. Fitzsimmons, died on 3 Nov., aged 80.

Mr W. M. B. Furniss, managing director of the Electric Construction Co. Ltd., died on 8 Nov., aged 47. Mr Furniss was the elder surviving son of Mr William Marter Furniss, chairman and managing director of the company until his retirement at the age of 83 in December last. Mr W. M. B. Furniss joined the company in May 1925, becoming sales engineer in 1929, assistant manager in June 1941, general manager in January 1943, director and manager in July 1944, assistant managing director in Sept. 1948 and managing director in Jan. 1954.

The death has occurred at St. James' Hospital, Balham, of **Mr R. Harley Finch,** aged 44, who commenced his engineering training with the British Thomson-Houston Co. in 1927, and who, since 1935, has been a lighting engineer working on technical sales promotion and specialising in the technical applications of lamps. Although born in Mexico, he was by residence a Londoner. He gained experience as a junior engineer in a number of London power stations, including Deptford.

Mr A. H. Ginman, formerly president of the Canadian Marconi Co. died in Canada on 7 Nov., aged 80. Born in Surrey, he joined the Marconi Wireless Telegraph Co. in the 1890's and worked for a time with Marconi himself. He became general manager of the company before being appointed president of the Canadian Marconi Co. in 1935, and at the same time general manager of Cable and Wireless Ltd. in Canada.

We have received from Mr E. P. Hill, M.SC.TECH., M.I.E.E., a lengthy tribute to **Mr R. E. Grime,** M.SC., M.I.E.E., whose death on 26 Oct. we briefly noted last week. Mr Grime was for a time assistant to the chief electrical designer (Julius Frith) of Mather and Platt Ltd, and shortly after 1906 took over the Design and Testing Sections of the Electrical Department, and for many years was responsible for their engineering side. Mr Hill writes to say that he "served an apprenticeship with Mather and Platt during the years 1906-1911 and Mr Grimes' character and sound scholarship were deeply impressed on those with whom he came in contact. His resounding energy of mind, his consistent skill in overcoming difficulties, his profound and accurate knowledge of principles, his complete fairness and honesty, were patent to all. The enthusiasm he constantly applied to engineering matters imbued his assistants to give of their best, and one felt it a privilege to join with him in any task in hand."

NEW LITERATURE

Insulation of Electrical Equipment

Edited by Willis Jackson, D.SC., D.PHIL., M.I.E.E., F.R.S.

WRITTEN primarily for engineers who are concerned with insulation design, this book is an edited version of a series of lectures which were originally delivered to post-graduate students. The aim is to cover all aspects of the insulation problems as they appear to engineers.

The subject is introduced with a chapter on the physical and chemical properties of insulating materials, and a discussion on permittivity and dielectric loss. The breakdown of the dielectric receives detailed treatment supported by photographs of typical samples which show the tracking experienced and areas of damage. A review of all the known forms of insulation follows, and mention is made of the latest H class materials. Communications components, power cables and electrical machines are then discussed. Chapters on transformers and switchgear, including methods of testing in laboratory, factory and field, wind up a book that no engineer should pass over. Amply illustrated and clearly written it represents good value for money. Published by Chapman and Hall, 340 pages, 8¼ in. by 6 in. Price 42s.

Statistical Methods in Electrical Engineering

by D. A. Bell, M.A., B.SC., PH.D., M.I.E.E.

IN his preface, Dr Bell is at pains to excuse the addition of another introductory book on statistics written for a specialist field. The engineer, however, has not been as well served as the biologist in such works, and the author's approach has the special merit of being written in "engineering" language, and of drawing its illustrations from familiar types of experimental work. There is no attempt in this book to avoid the heavy algebra needed for the derivation of even the more elementary formulae used in statistical work. However, the reader should reap the reward for the application thus demanded of him in a more complete understanding of the various common distributions and significance tests than introductory volumes usually give.

After early chapters discussing classification and distributions, the author proceeds to discuss curve fitting, the reliability of data and information theory among other topics. One further chapter deserves comment: there is a brief but useful discussion of the theory as distinct from the practice of quality control. Engineers engaged on research and development work especially should find time given to this book well spent. Published by Chapman and Hall, 175 pages, 8½ in. by 5½ in. Price 25s.

BOOK RECEIVED

Direct and Alternating Currents, by E. A. Loew and F. R. Bergseth. This edition now incorporates m.k.s. units, with further additions of subject matter. Fourth edition, published by McGraw-Hill, 637 pages, 9 in. by 6 in. Price 60s.

BRITISH STANDARDS

Polythene-insulated cables, sheathed with p.v.c. for electric power and lighting up to 250 V. *B.S. 1557:1954. Price 5s.* This new edition supersedes B.S. 1557: 1949 but deals only with polythene-insulated cables sheathed with polyvinyl chloride. The principal feature of the change is the reduction in insulation and sheath thickness which has been found possible as a result of experience since the publication of B.S. 1557:1949. Other changes are the inclusion of quality requirements and tests for the p.v.c. sheath and a method for the determination of the grade of the polythene insulation. It has been considered desirable to specify tinned copper conductors as standard, the main advantages being ease of jointing and resistance to corrosion. The standard reference temperature of 20° C has been adopted, as in other recent British Standards for cables. It should be noted that the 250 V cables specified in this standard are deemed to be suitable for use on a three-phase 440 V system having its neutral point solidly earthed.

Composite units of switches and fuses for use in industrial systems and domestic circuits. *B.S. 2510:1954.* To meet the demand for a standard for l.v. and m.v. switches and fuses, mechanically combined and electrically connected in series, the B.S.I. has recently issued a standard covering units with air-break switches. It deals with units having not more than four fused poles and suitable for current ratings up to 200 amps on domestic circuits and industrial systems where the declared voltage does not exceed 250 V. Sections are included on rating, construction, operation in service, marking and tests. The type tests specified include a mechanical endurance test requiring on and off operations to a total given by 60,000/current rating in amps; the minimum to be 500 operations. Appendices deal with the selection of fuses and with temperature measurements.

Carbon brushes (parallel-sided), for use on commutator and slip-ring machines. *B.S. 96:1954.* This revised standard applies to carbon, graphite and metal-graphite brushes, with the exception of those used in aircraft. The various brush sizes have been revised and the identification numbers of the brushes included in the 1938 edition have been altered in consequence. In addition to the adoption of a new system of numbering the brushes, some extension of scope has been possible and a range of brushes such as are commonly used on commutators of traction motors has been added. The specification is intended as a step towards the ultimate standardisation of brushes.

Jubilee in Birmingham

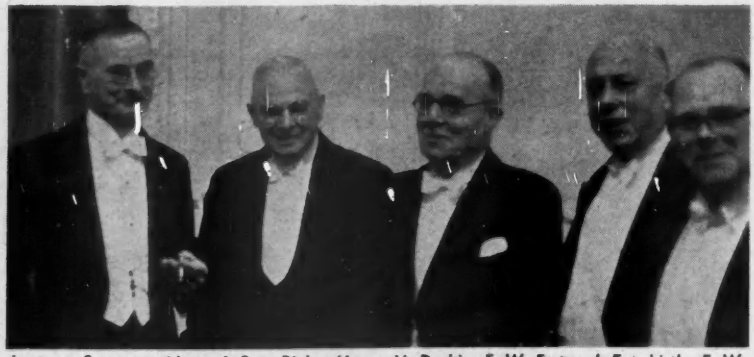
IT was a unique occasion in Birmingham last Friday when the Birmingham Electric Club held their Golden Jubilee Banquet, for it was on Guy Fawkes night in 1904 that the Club was inaugurated. The gathering was a distinguished one, with the president, Mr H. M. Fricke, in the chair.

After a toast to the City of Birmingham by the Lord Bishop of Birmingham, replied to by the Lord Mayor, Lord Citrine proposed "The Birmingham Electric Club." He spoke of the electrical industry when he was first apprenticed fifty year ago and when he returned to the industry seven years ago he was amazed at the miracle that had taken place in technical development. He had found great friendliness for it was a "matey" industry and it was this that had carried them through the difficult time of vesting. He was still concerned with the shortage of generating plant and it was doubtful whether this year the figures for new plant would even reach that of last year, which was already below the target. This slowing up had been due to the shortage of reinforcing steel in 1952 and work had been held up on eleven stations for this reason. A considerable improvement in plant should take place next year and for 1958 the Government had authorised installation of 1,750 MW. Although anxious about next winter he was hopeful that power cuts could be avoided, but every available kilowatt of plant would be wanted. As a step towards returning plant to service quickly after breakdown the B.E.A. were planning to establish their own central workshops in the Midlands and certain other divisions. This would reduce the strain of repair work on manufacturers already fully occupied in new plant for home and overseas.

In replying, the president said that this club was the largest and oldest in British engineering. From a membership of 17 in 1904 it had grown to 650, which was broadly based on the industry as a whole. They had founded a students scholarship and among their activities for charity he mentioned the work of past president, D. Kingsbury, who from the sale of photographs of social occasions had provided over £300 for the E.I.B.A. Mr Fricke then referred to some of the older past presidents who were at the dinner.

The final toast, that of "Our Guests," was proposed by Mr H. C. Knox, senior vice-president, and the response was by Dr R. S Aitken, vice-chancellor of the University of Birmingham.

The top table with the Lord Mayor Mr H. M. Fricke and Lord Citrine



A group of past presidents, Left to Right: Messrs N. Deykin, F. W. Foster, J. Entwhistle, F. W. Martin and A. T. Haywood

Wet Type Submersible Motors

TESTING NOW IN PROGRESS ON A 3·3 KV UNIT

ONE of the major difficulties in the application of large low tension submersible motors is the size of the cables required to carry power to the motor. Bearing this in mind the Harland Engineering Company started the development, some time ago, of a high voltage 3·3 kV, 50 c/s a.c., 250 h.p., 1,450 r.p.m. motor. Extensive investigation indicated that polyvinyl chloride was a good material, not only for the stator winding but also in the form of tape for endwindings. The number of joints, all of which are a potential source of weakness in a wet-type machine can be reduced to a minimum by using a pull-through winding.

Mechanically, the design of wet- type submersible motors includes many unusual features. The diameter is limited by that of the borehole in which to has to operate. A motor with an output of 60 h.p. at 2,900 r.p.m. may have to go down a borehole of only 10 in. diameter. Thus the ratio of stator core length to diameter may be large, and for the case quoted is about 4·5 to 1. In mining applications, there may not be the same restriction on diameter, but normally the same design is used.

Because the machine is running under water and is not readily accessible for maintenance bearings are usually water lubricated, the journals consisting of a stainless steel shaft running in a plain carbon brush. For thrusts, carbon tilting pads running on a stainless steel thrust plate have been found satisfactory, and can even stand up to reverse running when the motor is shut off and a head of water is available sufficient to drive the pumps backward.

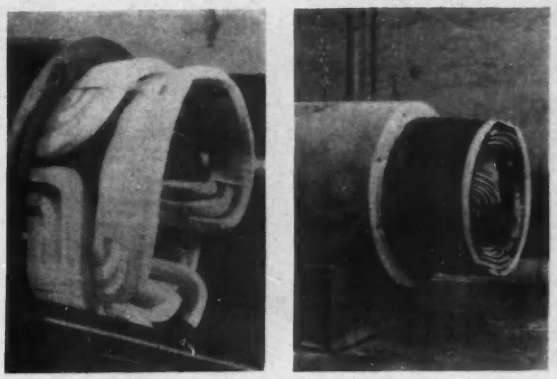
Although the motor itself is charged with distilled water prior to submersion, and this is sealed off from the water being pumped, external water, possible corrosive in nature, can enter due to "breathing" of the motor. Corrosion resisting materials and coatings are therefore used wherever possible to minimise the effects of any ingress of external water. So efficient are these precautions that motors have been known to run 30/35 thousand hours without servicing.

The 3·3 kV Unit

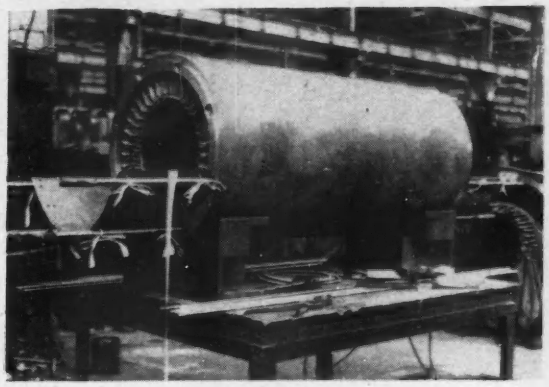
In the high-tension motor, p.v.c. was utilised, and by careful design the number of joints in water was reduced to one—the star-point joint—by taking the winding wire straight into a sealing chamber built on to the motor frame. Connections in the chamber were insulated by covering with plasticised polythene and wrapping with adhesive waterproof type. The whole chamber was then filled with waterproof sealing compound. As the star-point is near earth potential, the insulation could be much less elaborate.

The complete winding was immersed in water for a week, and its insulation resistance checked daily. After this test had been passed satisfactorily, the machine was assembled and run on test for some time. It was clear that the development had been carried to a stage where long-term testing was necessary, so the machine was again filled with water and every day for six months the full operating voltage applied to the stator winding, a flashing transformer being used for this check. On completion of the test the motor was dismantled and the windings examined. All were perfect.

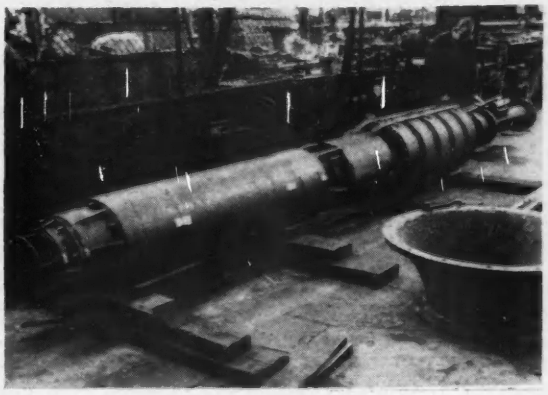
The next step was to get the machine in service under practical running conditions, and to this end the National Coal Board was approached. The pump and motor were installed at the Castle Pit of the South-Western Division. Trials began in July 1954, and are still in progress.



The end winding of partly wound 4-pole submersible motor with right the finished winding of a small 2-pole submersible motor



Unwound stator frame of a 450 h.p. submersible motor showing alkaline slot liners, and below submersible pump set to deliver 1,000 gallons p.m. against 570 ft head. Motor is rated 205 h.p. at 1,465 r.p.m., 400/440 V.

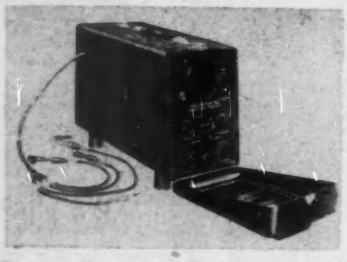


Equipment for Industry

Car Ignition Tester

IN order to take the fullest advantage of the high performance and economy that new "Premium" fuels, available for motor vehicles, can give it is essential that all features of the ignition system should be functioning correctly. Badly gapped plugs or dirty contact breaker points, constant sources of trouble, and other more subtle faults take time to detect and it is with a view to "pin-pointing" the exact location of trouble-spots that the new Ignition Tester was developed. ENGLISH ELECTRIC CO., LTD., Marconi Hse, Strand, W.C.2, are the makers of this instrument, which is being marketed by TECALEMIT LTD.

The equipment employs a small cathode ray tube, on which wave-forms of the complete system may be obtained from the running engine. By comparison with a chart provided, it is said to be possible to diagnose immediately faulty condensers, plugs, or coils, and in the last case faults in both primary and secondary windings are said to be easily detected. In addition to fault-finding, after a little use, the instrument may be employed to anticipate breakdowns in ignition systems. By this method, "preventive maintenance" may be carried out. To ensure that the instrument is used correctly by garage operators, a special course of training is being arranged by Tecalemit Ltd. The instrument works from the 6, 12 or 24 V supply available from the battery used in the vehicle.

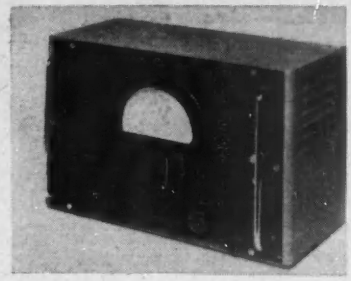


This tester may be used to anticipate or detect faults in ignition systems

Accurate ohmmeter

INTENDED for production and laboratory continuity testing, a new ohmmeter (type 861) manufactured by AIRMEC LTD., High Wycombe, Bucks, enables the value of any resistance between 1 ohm and 10 megohms to be determined. A large meter, having a scale length of approximately 7 in. is employed, thus enabling excellent reading accuracy to be obtained.

The instrument operates from normal a.c. mains supply, the d.c. test voltage being obtained from an internal stabilised source. Six resistance ranges are provided, these are selected by push-button switching. The ranges are multiples of the meter reading, except the highest which has a separate scale calibrated from 0·1 to 10 megohms. Since the instrument is enclosed in a standard "Airmec" case, it is suitable for forward mounting on a 19 in. rack or for bench work. Finish is wrinkle grey enamel for case and polished black for panel.

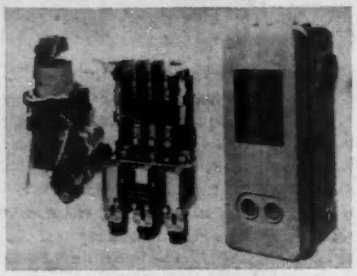


This useful instrument has a working range from 1 ohm to 10 megohms

Starter for Loom Motors

TEXTILE machinery in general and looms in particular impose particularly arduous conditions on associated equipment, and of this equipment the control gear probably fares the worst. The effects of vibration and high frequency of operation on contactors soon find weak-spots in design and it was with a view to eliminating these that ALLEN WEST CO., LTD., Brighton in collaboration with the BRITISH NORTHROP LOOM CO., LTD., developed the new type "BNL" contactor starter. Totally-enclosed in a pressed steel metal case, the starter is of the air-break type, having two breaks per phase.

Two phenolic mouldings supplied by LORIVAL PLASTICS, the base and a rocker, house the fixed and moving contacts respectively. A special feature of the contactor is that for the purposes of easy servicing, by moving two spring clips, the whole mechanism may be withdrawn from the casing, leaving the main connections undisturbed. The rocker and base can then easily be separated and the faulty component replaced. Three magnetic overcurrent relays with adjustable oil dashpot time lags and a restrainer device are mounted on the base. These are controlled by the "Stop/Reset" push-button. Adjustment is provided from 25% overload upwards by altering the setting of the self locking dashpots—the calibration plate is scaled in amperes.



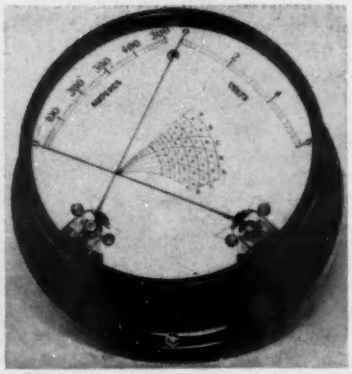
The two mouldings shown on the left are secured in this case by means of two spring clips. Servicing is simple

An undervoltage release is fitted and the contactor is arranged for either local or remote operation of the solenoid.

Suitable for operation on single, two or three phase a.c. supplies of up to 650 V, the unit may be used on motors rated up to 7½ h.p. A four-pole isolating switch electrically operated with the contactor and mechanically with the cover makes it impossible to open the unit while the supply is connected.

Plating Control Indicator

SPECIALLY designed for use in plating works, the new indicator produced by MEASURING INSTRUMENTS (PULLIN) LTD., Electrin Works, Winchester St, Acton, W.3, combines the functions of an ammeter and voltmeter in one instrument. In addition to the two-scale readings for voltage and current, a third scale, derived from the positions of the pointers at various readings, may be used to interpret conditions in a plating vat. It is claimed that the indicators have proved themselves useful to platers and that detection of faults such as low solution strength, short anodes and bad connections are possible. This is said to apply to both the skilled plater and unskilled worker employed on production plating.



The "extra" scale marking is shown clearly in this illustration

"Protectafil" Saves Money

HIGHLY recommended by satisfied users throughout the country the "Protectafil" shock-absorbing suspension unit for lighting saves money through prolonging lamp life and reducing maintenance costs.

These units by J. E. WILDBORE LTD., 6-12 Peter St, Oldham, Lancs, are available in five different models. No. 1 is suitable for ½ in. or ¾ in. conduit drop tube suspension. No. 2 for ceiling hook and conduit drop tube suspension. No. 3 has a long neck hook for chain suspension of fluorescent and heavy pendant lighting. No. 4 is fitted with top plate for screwing to ½ in. conduit or ¾ in. with ¾ in. x ½ in. reducing bush, whilst No. 6A is an angle bracket for fitting to junction boxes on north ceiling lights.

Basically the Protectafil is a die cast alloy enclosure with an internal tapered spring coil which, resting on a rubber washer at its base, has a damping effect on vibration of the pendant fitting.

Versatile Recessed Ceiling Fitting introduced by Ediswan

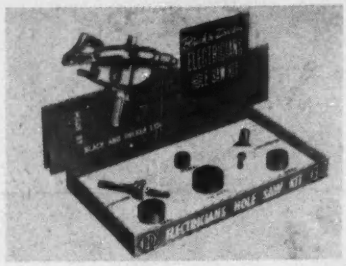
FOR fitting in most types of hollow ceiling the EDISON SWAN ELECTRIC CO., LTD., 155 Charing Cross Rd, W.C.2, have made available a versatile type of recessed ceiling fitting. It comprises an industrial trough reflector for one or two fluorescent lamps inside a steel frame surrounding the ceiling aperture. This frame is secured to the ceiling or where a false ceiling is used provision can be made for the suspension of the fitting from the main ceiling.

A particular feature is the retractable lug device operated by a simple key in which the reflector can easily be released and lowered by one man to give access to the control gear. In this position the reflector remains suspended by lugs on one end but a simple lift and twist movement detaches it completely and it can be taken down to floor level for maintenance.

V.C.* for this Electric Kettle

THE extension of automatic control to the electric kettle with the introduction of the new model embodying Vapour Control* by RUSSELL HOBBS LTD., 1 Bensham Lane, West Croydon, Surrey, brings an end to the annoyance of steam-filled kitchens.

This kettle embodies a switch mechanism which will break the circuit when the water reaches boiling point thus enabling the makers to employ a high loading element which will boil 2 pints of water in four minutes. When the mechanism operates an indicator "pops up" in the handle. To bring the water back to the boil again this indicator is simply depressed. Maximum capacity is 3½ pints but by careful design a minimum of one pint of water may be boiled. Made in heavy gauge copper tinned inside with chromium plated exterior and carefully balanced moulded handle, the V.C. kettle sells at £4. 4s. list price.



Hole Saw Kit for Power Drills

HOLE saw kits for use with power tools have been introduced packed in one compact unit by BLACK AND DECKER LTD., Harmondsworth, Middx.

The pack contains ¾ in., 1 in., 1¼ in., and 1½ in. fine tooth hole saws with two mandrels which include a pilot drill for centre-ing the hole saw and keeping the cutting concentric. Price of the pack D7811 is £3. 0s. 6d.

A similar pack D 7815 priced £3. 10s. 6d. is designed mainly for plumbing work and includes ¾ in., 1 1/16 in., 1¼ in., 1 5/16 in., and 1 11/16 in. fine tooth hole saws with two mandrels. These saws give clearance diameters for most used steam and gas pipe sizes.

The firm, however, have a large range of hole saws in fine tooth, coarse tooth and high-speed saws ranging from ¾ in. to 4 in. and corresponding mandrels.

For the Electrical Trade

•

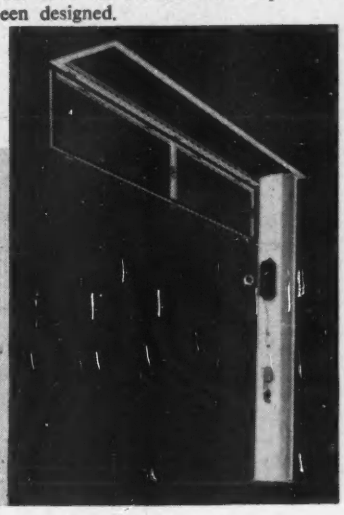
EMI Tapes 77 and 88 are New

OUTSTANDING features of the new Emitape are high sensitivity; marked anti-static characteristic and freedom from curl.

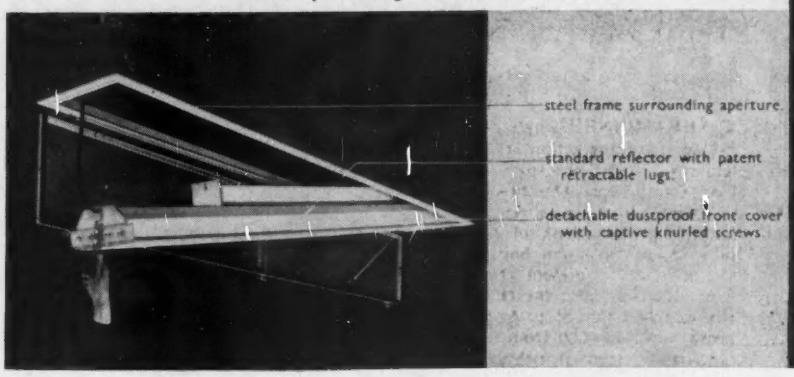
E.M.I. SALES AND SERVICE LTD., Hayes, Middx, point out that the latter ensures uniform and close contact with the head and therefore uniformity in recording and reproduction.

Sensitivity is considerably higher than previously (9 dB above 450 tape), whilst basic unweighted noise from a properly erased tape is at least 65 dB below peak recording level and modulation noise at least 50 dB below peak modulation at 2% total harmonics. Most important however, is the high degree of sensitivity uniformity achieved by the new tapes. Both 77 and 88 are manufactured under the same conditions and to the same specification but every reel of 77 tape undergoes a special "pen test" to ensure a level of sensitivity not exceeding ± ½ dB on a 1 kC signal and an overall variation from reel to reel not more than ± 1 dB.

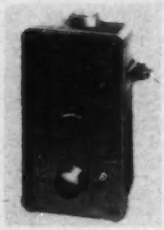
Both types are available in a range of five sizes of spools whilst for the 5 in. and 7 in. reels an attractive new spool has been designed.



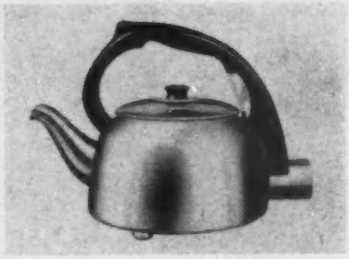
Ediswan new fluorescent fitting is for use with hollow ceilings. These illustrations show the fitting lowered for cleaning and maintenance


steel frame surrounding aperture
standard reflector with patent retractable lugs
detachable dustproof front cover with captive knurled screws

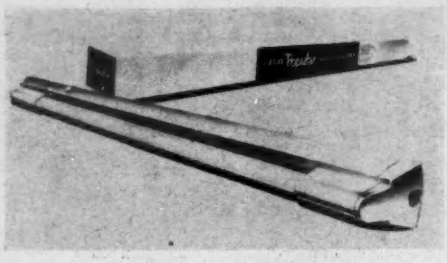
Toast at table is so easy with the "Pye" toaster



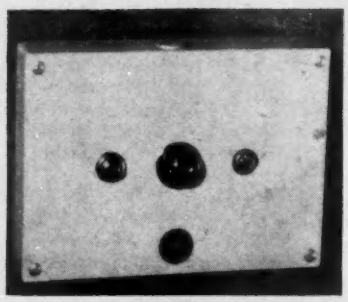
A versatile kitchen machine, the "Mill-tric", takes ten seconds. On the right is the new Thermovent watertight thermostat, see "E.T." 4 November

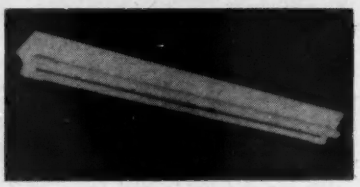


Above is Russell Hobbs new kettle which features vapour control whilst right is the new twin version of the Mazda Seagull



Davey Diamond fire (left) is forerunner of a new range, whilst (right) the "Popular" fluo kit by Thorns is well named, and below, right, the neat and necessary Gents mains failure alarm





Ten Second Kitchen Mill

A NEW line by SEW-TRIC LTD., Honeypot Lane, Stanmore, Middx, which is proving a popular line with traders is the "Mill-tric" electric coffee mill.

It is a neat and versatile appliance in cream plastic with transparent cap and push button control of the motor. Its ten second action handles other products besides coffee beans. Lentils, nuts, sugar, rice and bread are some of the foods which can be milled quickly and easily with the "Mill-tric."

Sell this "Popular" line

TO sell at just under £5 complete with tube the Atlas "Popular" fluorescent pack looks to be a good selling line.

This new pack by THORN ELECTRICAL INDUSTRIES LTD., 233 Shaftesbury Ave, W.C.2, features a well-designed and constructed slim general-purpose batten fitting with an Atlas 80 W 5 ft Double-Life "White" tube. Control gear includes 80 W universal starter switch, Class "A" tapped choke to suit any a.c. mains supply 200-250 V.

For £4. 19s. 6d. complete and ready for easy fixing to any ceiling point the "Popular" is just the line to satisfy the growing demand for fluorescent lighting.

Davey Diamond first of a new range

FORERUNNER of a new range of fires the "Davey Diamond" introduced by A. D. DAVIDSON ELECTRIC CO., LTD., Granville St, Birmingham 1, is most individually styled.

It has pressed steel sides designed to give robust construction and is fitted with chrome reflector and chrome guard in accordance with the B.S. specification. Two colours are available, stone or pastel green, and the fire measures 15½ in. high by 15½ in. wide and 8¼ in. deep. Both 1 and 2 kW loadings are available. In the latter case a switch controls half or full heat. Prices are as follows. 1 kW model £2. 17s. 6d. plus £1. 1s. tax. 2 kW model £3. 5s. 6d. plus £1. 4s. tax.

Pye Toaster

STREAMLINED styling and easy twist turning action are entirely new features of the new toaster from PYE LTD., Cambridge. One twist of the plastic handle and the slices are reversed instantly without risk of burnt fingers. In a smart chromium finish the toaster makes a valued present at 52s. 6d. tax free. It can't harm the table for specially designed tabs stop the fully opened bread rack one inch from the table thus protecting it from scratches and burns.

Mains Failure Alarm by Gents

THE damage that can be done in both industrial processes and agriculture and stock rearing if the mains supply fails without warning can be so extensive and costly that the new 1487 mains failure alarm by GENT AND CO., LTD., Faraday Works, Leicester, will justify its cost on installation.

When the unit is switched on a small red pilot lamp is illuminated. Should the mains fail a buzzer is sounded and the lamp is extinguished. The unit is housed in a metal case 7¾ in. by 5½ in. by 3 in. and provision is made for an extension bell or relay. Suitable for 200/250 V a.c. supplies the unit costs £11 including batteries (2 U2 torch cells).

Twin Lamp Mazda Seagull

NOW available from the British Thomson-Houston Co., Ltd., Crown House, Aldwych, W.C.2, is a twin lamp version of the Mazda "Seagull" 5 ft fluorescent fitting. Constructed in sheet steel and stove enamelled white the "Seagull" fitting comprises a lamp auxiliary gear tray enclosed by a V-shaped reflector channel. Auxiliary gear includes a B.T.H. "brick-type" ballast and "Permitol" capacitor. The fitting incorporates the "Pendicone" suspension system and costs £13. 11s. 4d.

PROBLEMS AND PRACTICE

In Engineering

Every engineer has a story to tell; why not tell yours on this page? We welcome contributions to this feature, and those published will be paid for at our standard rates. Problems which are encountered and overcome in day-to-day maintenance or installation of electrical plant; useful methods and techniques developed for specific jobs, or current practices, all make instructive reading for others. We will also consider for publication problems requiring an answer. Sketches are often helpful and need only be rough, as they will be redrawn before use.

Control Switch Failure

SOME time ago we installed a bank of 11 kV switchgear. It was of the double busbar type, it being possible to connect any o.c.b. to either top or bottom busbar while on load as long as the bus-coupler o.c.b. was closed, with full key interlocking to prevent mal-operation.

At the time the h.t. cables had not been connected, but as the auxiliary wiring had it was decided to test the closing, tripping and indication circuits, which were supplied from a 230 V battery. During the test everything seemed satisfactory but afterwards it was found that the control switch for the bus-coupler had burnt out, being now a useless part of the tripping circuit. Examination showed the wiring and connections to be in order, so a new control switch was obtained, installed, and when tested, worked perfectly.

However, there was another test later on, and the same fault occurred. I was asked to find the cause of the trouble, but after a thorough examination and testing could find nothing wrong. However, I noticed that the auxiliary switches mechanically connected to the o.c.b. had two switches in series in the trip, both having hefty contacts. It struck me that the reason for this would be that though the tripping circuit would be closed at the control switch it would normally be broken at the auxiliary switch, which opens when the o.c.b. opens, and as the trip circuit would be highly inductive, the two switches giving four breaks would be necessary to prevent excessive sparking. As during the tests the control switch had been operated to trip when the key was out in order to test the locking mechanism, the o.c.b. would not trip, and the onus of breaking the circuit would be on the control switch.

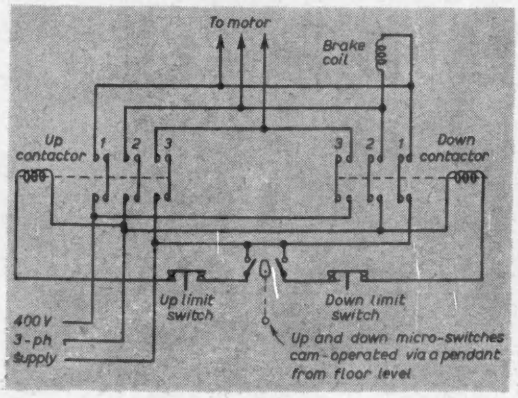
Evidently the control switches are only designed to make, but not break these inductive circuits and would not have to do so in normal operation. An electrical lock opening the trip circuit when the key was turned and withdrawn would obviate this trouble, but now that the switchgear is in operation it is hardly likely to occur again. However, it is as well to bear the point in mind should similar tests be contemplated in the future.—*J. H. Dowell.*

Phase Testing

THE cases given recently of the unreliability of testing between phase and earth for faulty supplies brings to mind an occasion a little while ago when I was called to an electric hoist block which would not operate in either raise or lower directions. The contactors controlling the hoist were housed with the solenoid brake mechanism at one end of the machine, with the circuit as shown.

I found that a pin had worked its way out of the brake mechanism and therefore the brake could not release to the off position when the motor was switched on. On replacing the pin however, the motor still refused to operate, but a check with a lamp tester between phase and earth appeared to indicate that all three phases were alive.

One of the micro-switches was then discovered to be short-circuited, and replaced, but I again suspected trouble on the supply and eventually found that a main fuse in the distribution board had blown. Replacing the fuse restored normal conditions, with the hoist now working satisfactorily. I then realised that the faulty phase which had lighted the test lamp had been fed from another phase through micro-switch and coil.—*E. Coles.*



This circuit of the hoist motor contactor connections shows how, with a short circuited micro-switch, it would be possible to obtain a positive phase-to-earth lamp test with a main fuse blown

Emergency Repairs

I READ with interest J. C. J.'s account (9 Sept. issue) of emergency repairs made to a motor by improvisation of materials and was reminded of a similar case I witnessed some years ago, when an elderly engineer of my acquaintance averted a serious and costly shutdown by the use of ingenious though unorthodox methods.

On a very isolated jobsite, a 5 h.p. squirrel-cage motor, which played an integral part in the functioning of a concrete mixing plant, was giving trouble. This motor, which was of an ancient vintage, was fitted with brass sleeve bearings. Due to improper lubrication, and the presence of abrasive dust in the air, the bearings had worn down to the point where the rotor was rubbing on the stator. Replacement bearings would have taken from ten days to two weeks to obtain, which at that particular stage, would have meant closing down the whole project. Neither was there any available material or equipment at hand to make new brass bearings. Undaunted by all this, however, my wily old friend proceeded to fit temporary babbitt bearings by the following method.

After disassembling the motor, he wrapped the rotor with a tight even wrapping of heavy paper, until it was a snug fit in the stator bore. This insured that the air gap would be uniform all round. From some scraps of asbestos board, he made two washers which were slipped over both ends of the shaft, and positioned by means of spacers so that they would fit tightly against the inner faces of the end bells. Then, using a candle, he applied a heavy even layer of soot to the ends of the shaft where they engaged the bearings.

After removing the old bearings, the motor was reassembled, pieces of hardwood dowel rod, also coated with soot, being inserted through the oil holes so that they touched the shaft. The motor was then placed so that the shaft was vertical, the end bells being warmed with a blowlamp to avoid chilling the babbitt. Then molten babbitt was poured into the space between the shaft and the wall of the end ball bearing hole, being prevented from going too far by the asbestos washers. Following this, the motor was reversed and the other bearing poured. The coating of soot on the shaft prevented the babbitt from adhering to it and also provided enough clearance for free running. When the washers were removed, the job cleaned up and lubricated, the bearings functioned perfectly. The whole operation took about two and one-half hours, and probably prevented a loss of ten thousand dollars.—*A. W. E.*

NEWS OF THE WEEK

New Move on Assisted Wiring

METROPOLITAN BOROUGHS NOT SATISFIED WITH L.E.B. REPLY

THE London Electricity Board is to be asked to reconsider their decision not to introduce an assisted wiring scheme. The Board's reply to suggestions that such a scheme be introduced in their Area was considered at last week's meeting of the Metropolitan Boroughs Standing Joint Committee and a resolution was passed stating that the committee was not satisfied with the Board's reply. It was felt that in the majority of cases, the cost of replacement or renewal of wiring would not qualify for an improvement grant, but hardship to the consumer could be avoided by the introduction of a system which was financially self-supporting. The borough councils are writing to the Board expressing their views, and are seeking the support of the Minister of Housing and Local Government to their representations. In addition copies of the correspondence involved are being sent to the Committee of Enquiry into the Electricity Supply Industry.

It will be recalled that the suggestion that a scheme of easy payments to help consumers keep their wiring installations in good order such as existed in many districts before vesting day, was first made just on a year ago. Numerous cases of hardship were reported to local councils, whose tenants could not afford the bill for rewiring, and landlords would not accept responsibility. The matter was referred to the Metropolitan Boroughs Standing Joint Committee. As reported in these columns, the London Board replied that responsibility should rest with the landlord or tenant, who if necessary could take advantage of financial or other facilities afforded by statute. They doubted whether such a scheme could be self-supporting and maintained that their limited capital expenditure allocation would not allow them to make the arrangements sought.

Exhibitions in North America Next Year

DATES of three exhibitions to be held on the N. American Continent in 1955 have been received. The next Hotel and Restaurant Supplies Exhibition is to take place in the Show Mart Building, Montreal, from 1 to 4 Feb. Only members of the Hotel and Restaurant Suppliers Association may exhibit but membership is open to manufacturers in countries other than Canada. U.K. manufacturers interested should contact the Association's secretary, Mr Adams, at 1638 Sherbrooke St West, Montreal.

On the other side of the Parallel, in Chicago, there are two shows which may well attract the U.K. manufacturer. The sixth National Materials Handling Exposition, organised by Clapp and Poliack Inc., 341 Madison Ave, New York, is to take place between 16 and 20 May. The National Housewares Show has been arranged for 13 to 20 Jan., and coincidentally there will be the Independent Housewares Exhibition, arranged to cater for the overflow from the National Show in previous years. The latter was held in the Morrison Hotel and attracted 181 exhibitors.

French Cable Experiments

REPORTS from Boulogne last week stated that French experiments on the cross-channel cable link are to start shortly. Experiments on the cable to be used in the planned exchange of power between England and France have been proceeding in this country for some time now.

MINISTER ABOLISHES BUILDING LICENCES

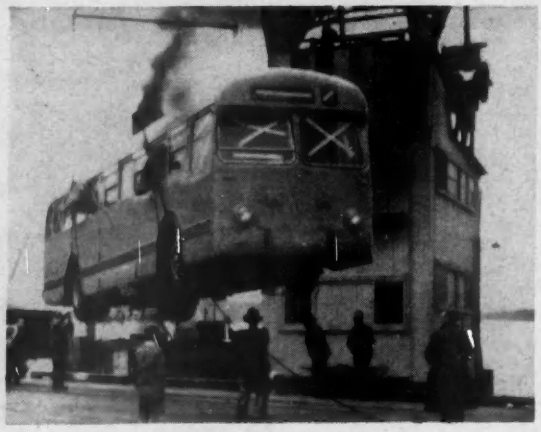
BECAUSE supplies of materials have steadily improved, building licensing has been abolished as from yesterday (10 Nov.). The Minister of Works, Mr Nigel Birch announced this in the House of Commons last week.

Electrical contractors questioned after the announcement was made were reticent in voicing an opinion on the possible effect of the revocation. It is not, however, expected to make a lot of difference. As in the case of the building industry in general, licences have been granted freely in the past few months and consequently there is unlikely to be any big spurt in constructional work. As far as the electrical industry is concerned, the licence-free limit of £1,000 has been a fairly high one and has not imposed drastic restrictions. The lifting of another control will of course be welcomed as a matter of principle and it will do much in a number of small ways to make life easier and freer of anxiety.

Defence Regulation 56A was first introduced in October 1940. Since then it has undergone numerous changes. Six years ago the first differentiation in financial limits by type of building was made when work to agricultural and industrial buildings was allowed without licence up to £1,000 p.a. and for other buildings to £100. Last Jan. these figures were £25,000 and £1,000 respectively.

U.K. Trade Trip to Peking

ARRANGEMENTS were recently completed for the visit of representatives of about 30 British companies to Peking this month. The party was expecting to leave this country yesterday (10 Nov.) and will spend about two weeks in the Chinese capital. A similar visit by a second party will probably be arranged for the New Year. These trips follow discussions held in this country last June between the Chinese Trade Mission and the Sino-British Trade Committee. Among firms of electrical interest represented in the first party are China Engineers Ltd., the General Electric Co., Ltd., I.C.I. Ltd., and Marconi (China) Ltd.



First of 40 B.U.T. trolleybuses for Auckland, New Zealand, being unloaded at Auckland. The vehicles have been fitted with British Thomson - Houston electrical equipment. They have the latest type of automatic acceleration equipment and will be the first modern trolleybuses equipped by BTH to go into service in N.Z. Delivery should be completed next month.

Success of Night Storage Heating in South-West

DURING the past 12 months the cheap off-peak rates for electricity have encouraged about 60 firms in the Bristol area and many more in the south west to install thermal storage space heating in factories, shops and offices. Mr S. F. Steward, chairman of the S. Western Board, told members of the Regional Board for Industry this at their meeting last week. He explained that the Electricity Board had designed their tariffs to promote an even, balanced load at power stations, and an excellent means of doing this was to develop the use of electricity at night. Manufacturers had done their part by research and development of new appliances, and the S.W. Board now offered special rates as cheap as ¼d. per unit for supplies at off-peak periods. Thus the operation of power station was assisted, and the small business man was provided with the benefits of central heating well within his means.

Besides the advantages of space and money saving, Mr Steward also pointed out that night storage heating helped to conserve the nation's fuel supplies and to keep down the price of electricity. This type of heating should also help to reduce atmospheric pollution. The chairman also reminded his audience that co-operation between manufacturers and the Electricity Board had provided a comprehensive advisory service to help industrial and commercial consumers to make the most efficient use of their electricity supply.

Radio and TV Sales Up again in August

ONCE again the R.T.R.A. has been able to report a further increase in sales of radio and television sets. Figures for August, just published, show considerable increases over the previous month, radio sales having risen by 0·56 and television sales by 2·23. When compared with the corresponding month last year, the figures are even more remarkable, rising by 5·19 in the case of radio and by 4·57 in the case of TV. Both the July and August 1954 figures were records for those months. Average number of sets sold per shop was:

	1954	1953
RADIO		
July	11·73	7·23
August	12·29	7·1
TELEVISION		
July	8·53	5·96
August	10·76	6·19

Vienna Meeting to discuss Terminology

DIFFERENCES in terminology used in technological glossaries and other international references were discussed at a conference in Vienna last month, arranged by the International Organisation for Standardisation. Representatives from Austria, France, Germany, India, Italy, the U.K., the U.S., Russia and Yugoslavia, as well as from seven international organisations attended. Britain was represented by Dr L. Hartshorn, of D.S.I.R., Prof R. O. Kapp and Mr Gordon Weston of B.S.I. The various ISO committees are preparing standard terms in their respective fields so that ultimately what will amount to a series of standardised multilingual vocabularies covering the whole industrial field, will be available. A start has already been made with the I.E.C. vocabulary of electrotechnical terms. A second edition is now being published. It gives terms and definitions in English and French, and terms only in five other languages. A separate Russian edition was produced.

Farmer wins £750 Damages over Faulty Installation

A NORFOLK farmer was recently awarded £750 damages following the loss of some animals and adverse effects on milk yields. The farmer alleged that four of his cows and five chickens were killed and 50 other cows had their milk yield affected because of faults in the dairy's electrical installation. He claimed damages of £779 against a London firm of electrical engineers who installed the system. The settlement was announced at Norwich Assizes when Mr Justice Pilcher was told that agreement had been reached on the basis of judgment for plaintiffs for £750, with no order for costs. The judge endorsed this agreement.

TOP SECRET

THE way in which a Tolworth woman by-passed her meter and obtained electricity without paying for it was withheld from evidence given before Kingston magistrates recently. A detective-sergeant, for the prosecution, asked whether the description should be read in public and the magistrates directed that it should not. Amount of electricity illegally used was said to be worth £2. 2s. 7d., and in addition the meter was specially geared to collect arrears of £6. 15s. The woman pleaded guilty and was fined £5.

OFFICIAL PUBLICATIONS

INDUSTRIAL DISPUTES TRIBUNAL AWARDS. 622: Wages of Apprentices employed in Electrical Contracting Industry in Scotland. Now available from HMSO 4d. (see p. 684, 4 Nov.).

BRITISH STANDARDS

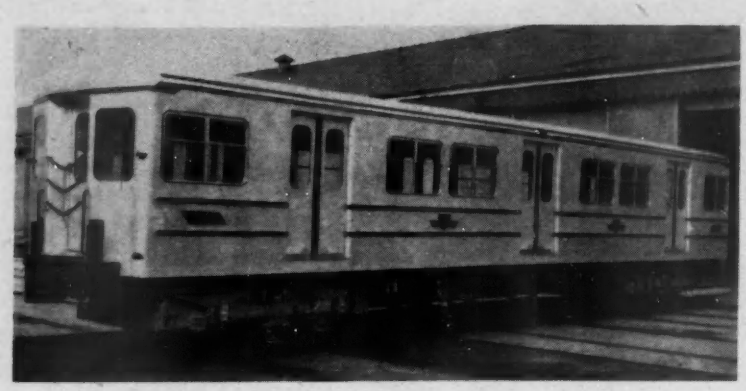
B.S. 441, 1954: Resin-cored Solder Wire "activated" and "non-activated" (non-corrosive). Amendment Slips: PD1969 (amending BS 37 parts 1 and 2, 1952) Electricity Meters; PD 1973 (BS 1270, 1952) Schedule for Electric Discharge Lamps for General Purposes; PD 1974 (BS 1308, 1946) Reinforced Concrete Street Lighting Columns; PD 1959 (BS 1862, 1952) Cables for Vehicles; PD 1990 (BS 2501, 1954) Manufacture and Testing Refrigeration Cabinets (reach-in type); PD 1991 (BS 2502, 1954) Manufacture and Testing Sectional Cold Rooms (walk-in-type); and PD 1967 (BS 2455, 1954) Methods of Sampling and Testing Boiler Water Deposits.

Contract for Southend and Chelmsford Electrification

A CONTRACT for the supply and installation of overhead electrification equipment for the extension of the Liverpool St—Shenfield railway line to Chelmsford and Southend, has been awarded to British Insulated Callender's Construction Co., Ltd., by British Railways. This electrification scheme was announced by B.R. last year and the extensions from Shenfield cover some 9½ miles to Chelmsford and 21 to Southend. Total cost is estimated at £2¼m. It is hoped that the new electrification will be completed by early 1957. Overhead equipment will be similar to that installed between Liverpool St and Shenfield, also supplied by B.I.C.C. It will operate at 1,500 V d.c., and on the main track will employ a compound catenary system comprising hard-drawn copper strand as the main catenary, and auxiliary supported by solid copper wires and a grooved cadmium-copper contact wire suspended from the auxiliary catenary by loop droppers. The three wires will be jumpered together in every span and will provide a flexible system enabling trains to run at speeds up to 70 m.p.h.

Production Censuses to be taken for 1954 and 1955

AN ORDER prescribing the information required in the 1954 Census of Production to be taken next year has been made by the Board of Trade. Questions will be included on such items as staff, wages and salaries, capital expenditure on plant and new buildings, stocks, transport payments, materials and fuel purchased, and output. Returns will be required from establishments employing more than ten persons. Small firms will have to submit only minor details, and of course, electricity undertakings are exempt by reason of their submitting information to the Minister of Fuel and Power. Census for 1955 (to be taken in 1956) will be a simplified census, taken on a sample basis as in 1952 and 1953. This will be in accordance with the programme of censuses recommended by the Verdon Smith Committee whose report was published recently. Much smaller returns will be required with fewer questions asked and only a proportion of concerns in each trade will be selected. The Verdon Smith Committee recommended that advance notice be given wherever possible to those firms who will be required to make a return, and this will be followed. Trades to be covered will be the same as in the 1954 census.



One of the six aluminium carriages ordered in the U.K. by the Toronto Transit Commission for the Canadian city's new underground railway system

£250,000 Rural Power Programme for Gloucestershire

NEARLY £250,000 is being devoted to the electrification of rural areas in Gloucestershire during the current financial year. Mr W. S. Lewis, chairman of the Midlands Electricity Board mentioned this figure when speaking at the opening of a three-day exhibition at Cheltenham Town Hall on Tuesday. As reported in these columns last week, the exhibition has been arranged by M.E.B. to demonstrate the contribution the electricity supply industry is making towards solving housing and other problems. Amplifying his comment on rural supplies Mr Lewis said that of 2,530 farms of over 10 acres in the Central Glos. sub-area, over 1,800 (71%) were now connected, compared with 1,100 in Mar. 1950. There were, he said, 24 major Farm Area Schemes into which rural development work had been divided in that sub-area and of those 13 had been completed, five were in the course of construction, and the other six would probably be completed within the next three or four years. In the past two years, £350,000 had been devoted to rural schemes in Central Gloucestershire.

PRIZEGIVING FOR HENLEY STUDENTS

AWARDS to members of the Henley Education Scheme who had distinguished themselves during the previous year were presented by Sir John Dalton (Chairman, Henley Organisation), at the twelfth Annual Students' Conversazione last Saturday. This was held at Woolwich Polytechnic under the Chairmanship of Mr E. J. Vidler, General Manager of Henleys. Sir John urged the students to join physical fitness to mental fitness, advocating some sport or exercise for everyone.

Later in the proceedings Mr W. C. Barry presented awards in the handicrafts competition. The formal proceedings were followed by an inspection of the handicrafts exhibits, and of a special exhibition "From raw material to finished product" which demonstrated the processes converting naturally occurring substances into the many complicated products of the Henley companies.

E.I.B.A.'s First Social in South Wales

THE S. Wales and Monmouthshire branch of E.I.B.A. recently held their first dinner dance at the Park Hotel in Cardiff. We are pleased to record that the event proved an outstanding success with an attendance of some 250 people and a profit of £230 donated to the Association's funds. Branch chairman, Mr L. Howles presided. Apart from the more "serious" events of dining and dancing, we note that other divergencies included some horse-racing with six model horses, which gave rise to good business by bookmakers and clerks on the "course."

Electricity Bill

FOLLOWING our note last week, the Electricity Reorganisation (Scotland) Bill has now been passed by the Lords, and its passage through both Houses of Parliament is now completed. The Bill now awaits the Royal Assent.

Aluminium Rolling Stock For Toronto Underground

FOUR aluminium alloy cars have just been completed by the Gloucester Railway Carriage and Wagon Co., Ltd., for Canada's first underground railway system opened in Toronto earlier this year. They will go into service in their natural colour with scarlet decorative trim. The four cars were ordered to obtain a comparison in operating costs with the steel cars in service at present. Use of aluminium has resulted in a saving of 5½ tons per car, reducing the overall weight from 22¼ tons to 16¾ tons. To assess comparative power consumption, kWh meters are fitted in the aluminium cars and in four steel cars. The operating unit comprises two cars, one carrying the air compressor and the other the auxiliary motor-generator set. The cars are 57 ft long and over 10 ft wide with seating for 62. Four 68 h.p. frame-mounted traction motors power each car. Economics of the aluminium cars have been studied by the Aluminium Development Association and by the Northern Aluminium Co., Ltd., who supplied the structural material. Two more cars of similar design are to follow to Toronto shortly.

BILLS CAN BE PAID AT VILLAGE POST OFFICES

SUGGESTIONS have been made in various parts of the country that facilities should be provided at local post offices for the payment of electricity bills, especially in rural villages and hamlets. We heard last week that the scheme is to be carried out in over 50 villages in Leicestershire and Warwickshire. Consumers concerned will be notified of this new service by the E. Midlands Board, who have informed the local committee of the Consultative Council of their decision. It seems likely that this example will be followed in other rural areas.

N.U.M. RECEIVE PEP TALK ON EXPORTING

"SOME NOTES on Export" was the appropriate title of an address to the National Union of Manufacturers given by Mr Leslie Gamage, vice chairman and joint managing director of the G.E.C. last week. Mr Gamage is also president of the Institute of Export. He began by saying that Britain's export position today gave every reason for pride in achievements over the past few years but there was no scope for complacency, and no excuse to rest on laurels won. Achievements had been gained with the help of improvements in terms of trade, but that improvement may not last. It seemed to be disappearing already and prices were having to be lowered to cope with fierce overseas competition.

Mr Gamage emphasised his opinion that more firms should start up an export business, and strongly recommended that more attention be paid to Commonwealth countries.

Among the recommendations he made to the N.U.M. were that more money should be invested in modern machinery to bring down production costs (here he mentioned again manufacturers' entitlement to greater tax reliefs); and that more attention be paid to appearance design. On the question of delivery dates, Mr Gamage said this country was grossly maligned. We fell down sometimes, he said, but so did our competitors in Germany and the U.S.A. The difference lay in the fact that we talked about our failures too much. He urged all exporters to boost, not only the individual products they were selling, but also Britain and her goods in general.

E.P.E.A. preparing Evidence for Herbert Committee

ALL sections of the Electrical Power Engineers' Association are being asked to send their views and observations on a number of matters to the Association's headquarters as a preliminary step in compiling and submitting evidence to the Herbert Committee which is enquiring into the efficiency and organisation of the electricity supply industry. Answers to a series of questions are required before 10 Dec.

Members have been asked to comment on five factors. The first concerns organisation, where they are asked whether the present separation of generation and bulk transmission from distribution was essential, and whether the Boards and Divisions could be combined in any way to advantage. Was the three-tier structure for Area Boards sound and would it be more advantageous to do away with sub-areas? On the question of service, members are asked whether the public was well served by stand-by maintenance, showroom and other consumer services. The third matter relates to staff and the success or otherwise of existing methods to ensure that the ablest men get to the top is queried. Is it a fact that many capable engineers feel wasted and frustrated too soon in their careers? asks the Association. Under the same heading views are sought on the possibility that much individual responsibility has been taken away from the engineer since nationalisation. Education and training form the subject of question number four, and the final matter raised is that of joint consultation.

The E.P.E.A. are not suggesting that the above headings will cover all matters which members might wish to comment upon. It is felt, however, that if priority is given to those matters it will assist the special council formed to prepare evidence for the Herbert enquiry.

I.E.E. Christmas Lecture on Nuclear Power

FOR the ninth year, the I.E.E. is arranging a Christmas Lecture for older schoolchildren. Previously, the lectures have proved immensely popular and there is every reason to suppose that the choice of subject for 1954 will attract as large if not much larger audiences than hitherto. The talk is entitled "Nuclear Power—Electricity from Uranium," and will be given by Dr T. E. Allibone. Venue will again be the Institution's Lecture Theatre and the lectures will be given at 3 p.m. on 30 and 31 Dec.

Shop Lighting Effect in London's Oxford Street

THE ingenuity of the illuminating engineer is being taxed to its limit these days by shopkeepers requiring that "little bit extra" in lighting effects to make them stand out from other shops in a large shopping area. One of the most recent examples of modern shop design and lighting is to be found in Oxford St, London, at the premises of George H. Lavey and Co., Ltd. Special fittings and lamps have been used throughout the two large showrooms occupying two floors, and were supplied by Siemens Electric Lamps and Supplies Ltd.

For all floor areas and windows, the company's "social colour" fluorescent lamps have been used giving a soft light almost identical in colour rendering to the normal filament lamp. Reflector spotlight lamps have been used to provide special emphasis where necessary, and in particular locations a lighting fitting to give either a spotlight or floodlight has been installed. This fitting employs either 100 W or 150 W lamps and has a focusing device and two-ring louvre. Altogether nearly 200 fluorescent and spotlight lamps have been used in the Oxford St premises. A similar installation has been carried out at the company's offices in Hare St, Woolwich. Electrical installations in both instances were carried out by Powis Electrical Co.

Latest in Packing

A FURTHER advance in the technique of protecting radar and electronic equipment for long periods of storage during transit has been achieved by Geo. Salter and Co., Ltd., of West Bromwich. This company has built one of the first "dry rooms" to conform with the new Ministry of Supply regulations governing the prepackaging of these goods. The "dry-room" uses a bank of electronic equipment to keep humidity at a fixed low level and to control temperature. Equipment is stored for specified periods and must also be packed inside the room to ensure that it reaches its destination unaffected by humidity. Nearly 100 persons are now employed by this company's Salterpak division handling a variety of products from nuts and bolts and hand tools, to large intricate and delicate electrical apparatus.

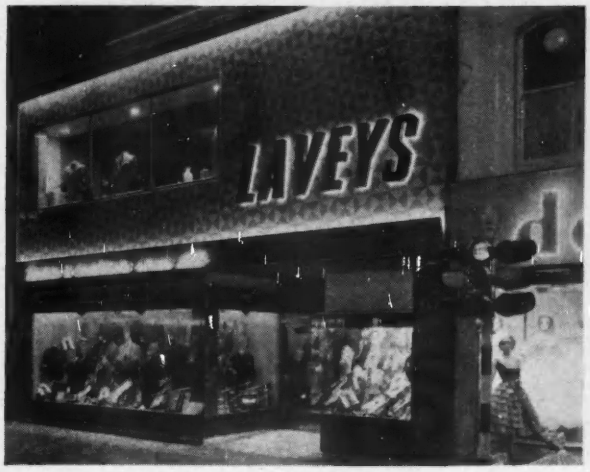
Lightmongers have Satisfactory First Year

THE "Lightmongers," an association of members of the principal lighting firms, and founded as a social organisation with a charitable object, held their annual dinner on Tuesday of last week. Mr W. S. Veness (Metropolitan-Vickers) was installed as the new president, and Mr T. S. Jones (Crompton-Parkinson) became vice-president. The retiring president, Mr Max Millar (Benjamin Electric) in his speech, referred to the increase in membership. From fifteen founder members the number had now grown to 33 present members. Owing to the present favourable balance, he was now able to present a cheque to Mr Fothergill, as a contribution to the Electrical Industries Benevolent Assocation.

The toast of "The Guests" was proposed by Mr W. A. Benson (Crompton Parkinson) and Mr A. E. Iliffe (Benjamin Electric) responded. Mr V. G. E. Gardner was singled out for special mention, together with his fellow committee members, for their hard work.

The First Half-Century

As President of the Glasgow University Engineering Society, Mr W. A. Chamen last week delivered an inaugural address which for its wide range of subjects surpasses almost anything of the kind I have yet read. There will be no electrical engineers in the next generation, he tells us, because all engineers will be electrical. Power supply in bulk is the coming thing, and even collieries will take it at the pit's mouth and find it cheaper for winding, etc., than steam generated by waste coal. A complete network of tramways and light railways is to connect our small towns together; electric motor cars will rival petrol cars, through getting a cheap relay of batteries every ten miles; overcrowding will be done away with; we shall get back to the land; there will be no more smoky chimneys; our boots will be cleaned and our carpets swept by electricity.—*From our issue of* 10 *November*, 1904.



Attractive fascia of a redecorated and re-illuminated shop in Oxford St, London, W.1, is enhanced by special fittings supplied by Siemens.

NEWS IN BRIEF

Three representatives from each Consultative Council are to be invited to attend the B.E.P.C. next year. Hitherto representation has been confined to two from each council.

"Babcock Steam" is the title of an up-to-date review of activities of Babcock and Wilcox Ltd. This brochure replaces a previous edition issued some three years ago.

Eighth annual Amateur Radio Exhibition organised by the Radio Society of Great Britain will be held at the Royal Hotel, Woburn Place, London, from 24 to 27 Nov.

Birmingham firm of Poles Ltd. have received orders for street lighting galvanised steel columns from the Kuwait Development Board.

Annual meeting of the Electrical Trades' Commercial Travellers' Association will be held at the Feathers Hotel, Broadway, Westminster, on 19 Nov. at 6 p.m.

We wish to point out that figs. 5 and 6 in our article "Resistance Welding Control" last week, were reproduced by courtesy of the English Electric Co., Ltd.

Third National Factory Equipment Exhibition will be held at Earl's Court, London, from 28 March to 2 April next year.

Next year's *Daily Mail* Ideal Home Exhibition will be held at Olympia, London, between 1 and 26 Mar.

Brighton Corporation have decided to buy appliances and installations hitherto hired from the S.E. Electricity Board at a cost up to Sept. last of £6,000. Purchase price is £1,034.

Department of Electrical Engineering at University College, London, have published a small catalogue of the exhibition opening next Tuesday to commemorate the jubilee of Sir Ambrose Fleming's invention of the thermionic valve.

Two Dozen Red Roses

"TWO Dozen Red Roses" adapted by Kenneth Horne, was presented by the Portland Players, the British Electricity Authority Sports and Social Club, Drama Section, on Thursday and Friday last, at the Portcullis Theatre in Monck St, S.W.1. This humorous production played before a full theatre had been entered for the B.E.A. Drama Festival. The adjudicator, Mr M. Morley, commented that this was an extremely difficult play and criticised the decor, pauses and the interpretation of Alberto Verani, the husband, by Laurence Clark and minor points only regarding Bernado, the "Floral Artist" by Anthony Hemming; Tomasso Savelli, the family friend, by James Rintoul; and Marina Verani, the wife, by Phyllis Martin—these deficiencies were scarcely apparent to an appreciative audience. The adjudicator seemed to be most impressed by the performance of attractive Pamela Love as Rosina the maid. The production proved to be a most enjoyable evening's entertainment.

Bath branch of the E.C.A. held their first dinner since the war at Fortt's Restaurant, Milsom St, recently.

Bristol branch of E.A.W. celebrated their 25th birthday with a dinner.

Research, development and achievements over recent years in the G.E.C.'s various fields of activity are admirably depicted in a booklet published by the company last month.

H.R.H. the Duke of Edinburgh inspected various departments of the Fulmer Research Institute at Stoke Poges and opened a new engineering laboratory.

COUNT YOUR BLESSINGS

THE appalling weather experienced in this country last "summer" has had its advantages in some quarters it seems. As a result of the excessive dampness, Winn and Coales Ltd., makers of Denso tapes and compounds are having to build an extension to their main factory to facilitate a 50% increase in production The summer apparently caused exceptionally severe corrosion conditions and this has been given as the cause of a huge demand for anti-corrosion pipe wrappings.

New Social Club for Apprentices

A NEW non-residential social club for apprentices has been opened at Stretford. On 1 Nov. Dr C. Dannatt, managing director performed the opening ceremony at "Kenwood," the name of the club, in Kenwood Rd, Stretford, which will be for the exclusive use of the Metropolitan-Vickers Apprentice Association. During the war, the premises was used by the company as offices but it has now been altered considerably and completely redecorated and refurnished. Facilities include an assembly room suitable for indoor games, lectures and dances, a large lounge, refreshment room and study. Much of the furniture and fittings was supplied by the company, but the Association has added plenty of recreational and other equipment (a TV set, radiogram, piano, etc.), from their own funds.

The new club will undoubtedly be well patronised. The Association is now over 2,000 strong, and a goodly proportion of these are from overseas, mainly from the Dominions, but also from S. America and Europe. Organisation of its affairs is in the hands of an Apprentice Council. Dr Willis Jackson, director of research and education, is chairman of the management committee.

QUESTIONS IN PARLIAMENT

Nuclear Generation

ASKED by Mr A. M. F. Palmer to estimate the quantity of electrical energy to be supplied from nuclear power at the end of the next 10 year planning period, Mr Nigel Birch, Minister of Works, said that it would be premature to attempt any such estimate, since the provision of electrical energy from nuclear power was still only at the experimental stage.

275 kV Grid in Gloucestershire

IT WAS suggested by Major Hicks Beach last week that the erection of pylons and 275 kV grid in Gloucestershire might be reconsidered in view of the fact that power stations of the future generating electricity by nuclear energy will not have to be situated close to coalfields. Mr Geoffrey Lloyd said that before giving his consent to the erection of the section of the 275 kV supergrid in Gloucestershire he had taken into account the possible effect of nuclear power development. He had decided, however, that the grid would not become redundant in the foreseeable future.

Pollution Measurements

DETAILED arrangements have been made by D.S.I.R. in co-operation with local authorities to measure smoke and sulphur dioxide and to identify other air pollutants this winter in the London area. During any period of persistent smog, civil defence volunteers would help in taking measurements. This was stated in the House last week by Mr J. R. Bevins.

Mercury Supplies

MINISTER of State, Board of Trade, Mr A. R. W. Low, stated last week that while he was aware that the price of mercury had been rising, he did not think that industry was having any serious difficulties in obtaining supplies. He rejected a suggestion that representations should be made to the U.S. Government about their policy of stock piling mercury.

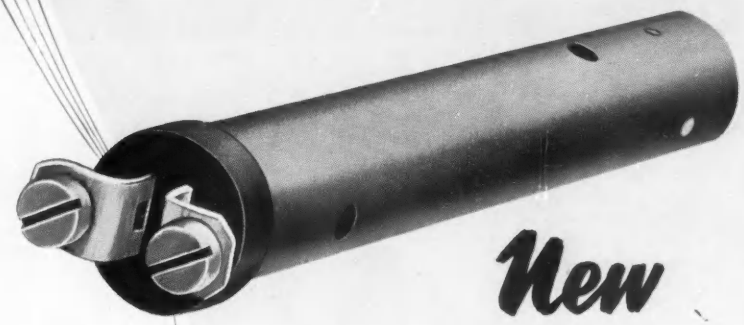
Instruments for the East

ANSWERING a question by Mr Swingler, Mr A. R. W. Low said that evidence submitted by members of the Scientific Instruments Manufacturers Association on the effect of the embargo on supplying certain types of scientific instruments to Eastern European countries, was under examination by the Board of Trade.

Industrial Information Overseas

AN Advisory Committee on Commercial Information Overseas has been set up by the President of the Board of Trade, it was announced last week. Its terms of reference will be to keep under review the range and character of information about U.K. Commercial and Industrial activities and achievement which is made available through official and non-official channels for overseas markets. It will

PROGRESS IN CONTROL



New

WATER HEATER THERMOSTAT

at half the price!

For many years the name Sunvic has meant dependable thermostatic control of electric water heaters. Now a new model, type TQB, whilst maintaining the same standard, is at the same time more compact and costs half the price. It is an immersed, withdrawable type and its performance complies with B.S. 1555. The only available thermostat conforming to present trends, its introduction marks an important advance in thermostat design.

One more example of the continuous development of *CONTROL*

EQUIPMENT BY SUNVIC

SUNVIC CONTROLS LTD. (*Domestic Division*), No. 1 Factory, Eastern Industrial Estate, HARLOW, ESSEX. *Tel.: Harlow 24231/5.*

Manufacturers of the Simmerstat, Oven Thermostats, Radiant Hotplates and Pneumatic and Electrical Instruments for detection, measurement, control and recording of Temperature, Flow, Liquid Level, Specific Gravity, and Pressure, in Science and Industry. Vacuum Pumping and Measuring Equipment, etc.

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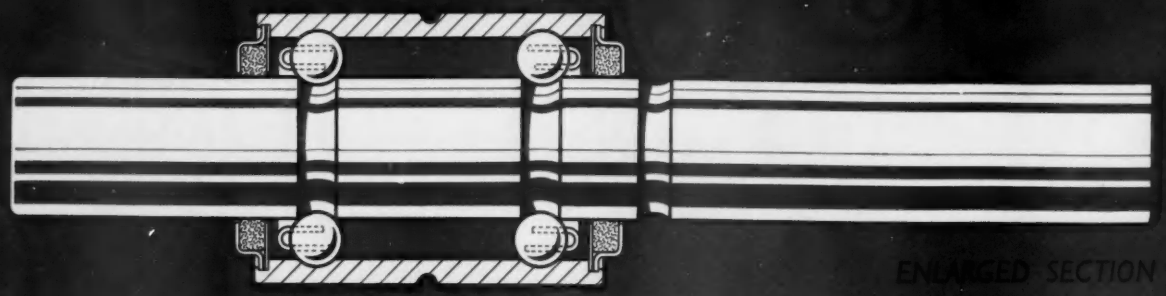

ENLARGED SECTION

Spindle-cum-bearings

Here is a useful unit which is incorporated in a great many motor cars and tractors: it is the spindle and bearing assembly for the fan and water pump.

Its advantages are self-evident; it is very compact and the inner race is kept down in size, an advantage with a fast-running spindle. The provision of the two outer races in one piece simplifies the housing and eliminates the risk of misalignment in bearing seatings bored from opposite ends.

We show some of the variations of this bearing which we make, because we feel that as a type it could be adapted—not necessarily in the same sizes—to a great many new uses.

To those interested, the collaboration of our engineers is freely available.

FISCHER BEARINGS CO. LTD., WOLVERHAMPTON

Fischer Bearings Co. Ltd., and Timken-Fischer Stockists Ltd., Birmingham, are both subsidiaries of British Timken Ltd.

FBC TRADE MARK ALL-BRITISH

BALL AND PARALLEL-ROLLER BEARINGS

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ACTUAL SIZE

also have the duty of suggesting ways in which information supplied through existing official channels can be improved, and of exploring possibilities of increasing the information through non-official channels.

Coal Spending

THE House of Commons has approved the draft Coal Industry Nationalisation (Borrowing Powers) Order 1954, which raises £40 m to £75 m. the amount which the N.C.B. may borrow in any one year.

Cross-Channel Cable

MINISTER of Transport and Civil Aviation, Mr Boyd Carpenter, stated last week that he had had no consultation with French Authorities about a study being made of the possibility of constructing a gallery under the Channel for electric and telephone cables. He also gave a negative reply to a question asking what communication had been made to the Channel Tunnel Co., as to the possibility of incorporating in any such gallery their plans for a tunnel serving as a pilot tunnel for a cross-channnel traffic tunnel.

Factory Inspectors

IN VIEW of the difficulty of obtaining suitably-trained staff for the factory inspectorate, Dr B. Stross suggested that an independent committee be appointed to advise on recruitment. Sir Walter Monckton said he was prepared to consider the suggestion.

Dr Stross gave notice that he intended to raise the matter on the Adjournment tomorrow (Friday).

Factory Inspector's Report

SIR Walter Monckton, Minister of Labour, stated in a written reply last week, that he hoped the Report of the Chief Inspector of Factories for 1953 would be published next month.

Sayings OF THE WEEK

"If we want our own export trade to succeed, we have to convince our customers to buy British, not just because it is British, but because in the long run it is the best." . . . MR LESLIE GAMAGE, vice-chairman and joint managing director of the General Electric Co., addressing the National Union of Manufacturers.

"I hope that the day is not far distant when electricity will release husbands from the tyranny of the kitchen sink!" . . . MR S. F. STEWARD, chairman of the South Western Electricity Board, speaking at the 25th anniversary of the Bristol E.A.W. branch.

"What we are perhaps afraid of is not the recommendations they (Herbert Committee) make, but the interpretation which Parliament gives them, because there are times when legislation can be directed to political rather than industrial ends." . . . MR L. HOWLES, chairman of the South Wales Electricity Board speaking at Cardiff last week.

ELECTRIC SUPPLY NEWS

Bolton

IF what had been described as "dark satanic mills" were to be modernised and if domestic hearths burning coal in open fires were not to continue to pollute the atmosphere of heavily built-up districts, there had got to be towers and conductor lines for the transmission of electricity both for factories and houses, declared Mr. G. A. Thesiger, Q.C., speaking for the B.E.A. at the public inquiry at Bolton last week. The inquiry was held into the proposals of the B.E.A. to erect a 275 kV transmission line from Blackstone Edge by Rochdale and then forward to a point by Delph reservoir, where it would branch north-west to Penwortham and south, running along the west side of Bolton to Carrington, near Manchester. Mr Thesiger said if the alternative route through the east of Bolton was followed the B.E.A. would not be able to vary the exact sitings of the pylons so as to suit landowners and occupiers. They would also have to make final additional crossings of existing 132 kV or similar lines, which was difficult and expensive. The B.E.A.'s scheme would need 203 straight towers and 47 angle towers, and would cost £1,370,000 to construct. The alternative route would cost the B.E.A. an extra £71,000 to construct and £30,000 maintenance. Bolton Corporation state that the proposed line would pass through areas of the town which the Development Plan provided as open spaces, and it would impede future development, apart from affecting amenities. The Lancashire County Planning Authority also considered the line would be seriously injurious to the amenity of a fine expanse of valley and moorland scenery. An alternative route was suggested, only half a mile longer than that proposed. For the Turton U.D.C., Mr R. Dart, the surveyor, said that Turton was willing to keep the pylon line somewhere in its district, but in the opinion of his Council there were several alternatives less evil than that proposed by the B.E.A. Mr H. W. Grimmitt, Ministry of Fuel and Power, and Mr J. G. Birkett, Ministry of Housing and Local Government, who conducted the inquiry, are inspecting the various routes put forward.

Eastern Board

During the month of Aug., the Eastern Electricity Board connected 5,264 new consumers, including 90 farms. In the corresponding month of last year the new consumers numbered 4,572 and 83 respectively. In the work of the sub-areas, mains extensions amounted to 26·7 miles of h.v. line, and 37 miles of l.v. line during Aug. On the high voltage side, the Norfolk sub-area contributed the longest mileage—10·2 miles, while the Northmet sub-area, with 9·8 miles again provided the largest amount of l.v. line.

Huddersfield

Having discussed with representatives of the Yorkshire Electricity Board the question of economic power supplies to Corporation housing estates, the Housing Committee is to put forward a plan for increased use of electricity on such estates. The committee's recommendations are: (1) That wiring be provided in new houses for electric immersion heaters and cookers (2) that electric cookers be installed in lieu of gas cookers where ingoing tenants so desire and (3) that the cost of providing an electric immersion heater be the tenant's responsibility.

Isle of Man

THE possibility of an interchange of bulk supply between the Douglas Corporation Electricity Department and the Isle of Man Electricity Board has been the subject of recent negotiations between the two bodies, it has been revealed. Intimation that developments were likely to take place in that direction was given by Councillor T. Radcliffe, chairman of the Corporation Electricity Committee. He stated that the corporation were making every endeavour to bring about co-operation with the Electricity Board towards the goal of cheaper electricity. With reference to the Corporation's £149,000 claim in respect of losses on plant purchased to meet the needs of the island's consumers, Councillor Radcliffe said he believed the matter would be settled within the next two months and added that he hoped it would be "to the satisfaction of Douglas ratepayers." Mr J. R. Corrin, chairman of the Isle of Man Electricity Board, is also reported to have said that the Board were still anxious to co-operate, and would be glad to help if that could be done without affecting their own undertaking. It has been indicated that the Board may take over the night generation of supplies for the Douglas Corporation so that the latter's Pulrose steam plant would be used only in the day time. Douglas Corporation are meeting this week when the matter may be discussed. It will be recalled that a year ago Tynwald passed a resolution asking the Lieutenant Governor to set up a Commission of Enquiry into the Island's electricity supply arrangements.

LIGHTING SCHEMES

Ennerdale. The R.D.C. is to convert gas street lighting to electricity within about three years.

Northampton. T.C. has approved the fourth stage of the street lighting conversion programme, estimated to cost £19,916.

Southport. Application has been made for consent to borrow £14,245 for three major sodium street lighting schemes.

COMPANY ACTIVITIES

SURPRISE of the week was an announcement of an interim dividend of 3% by the Brush Group. Last time there was only one dividend of 6% which was paid from earnings of only 7½% after providing for the last of the losses on the ill-fated Indian tube well venture. With these debits out of the way, the earnings situation, assuming profits continue as last time, will look very different and it should not be difficult for the management to return to the 10% annual rate which was paid for several years previously.

A smaller surprise was the announcement of a 10% interim dividend by E. Shipton and Co., (Holdings), the 2s. shares of which were introduced to the Stock Exchange last March, and now stand at 4s. 9d. Shiptons specialise in the manufacture of telephone and other signalling equipment. Its main activity is the installation (principally on hire but occasionally by purchase) of internal telephone systems. The company's finances at the moment are complicated because of the setting up of the holding company, the introduction of the shares to the Stock Exchange, and the effect of Excess Profits Tax. In their introductory statement the directors anticipated a dividend of not less than 17½% for the year to 31 Mar., 1955. The interim of 10% rather suggests that it will be more than that figure in the absence of some unexpected trading difficulty.

Profits of Tube Investments for the past year are particularly interesting as the company is in the process of changing itself from a horizontal combine into a vertical group. Previously it had fairly similar manufacturing interests in a number of different industries—steel tubes, aluminium, electrical goods, and general engineering. Even then it had one phase of vertical integration in the supply of tubes to the cycle division. Now has come the acquisition of the Round Oak Steel Works which is a further step towards strengthening the vertical set up. This is a most important change because it cost T.I. something like £9 millions including its undertaking to repay 3·2 millions of Round Oak Loan Stock. It is unlikely that T.I. will need all the output of Round Oak. So that the newcomer should in future add to T.I.'s profits. In the meantime, during this year of change, the dividend is up from 15% to 17½% although profits show a slight reduction of £33,000 at £2·68 millions. This meant that equity earnings were also slightly down, from 67½% to 63½% but the higher dividend was still covered over 3½ times, which is quite impressive.

These results have been obtained despite a slight set back in deliveries of tubes. The aluminium division, which made a substantial loss in 1952/53, should have contributed more as aluminium consumption rose by nearly 25% during the company's 1953/54 trading year and the price increased from £150 to £156 per ton.—*From our City Correspondent.*

Burco Ltd.

This concern reports record profit figures for the year ended 30 Sept. last, it seems from the preliminary statement. After allowing £112,741 for taxation (against £41,983 for the previous year), the taxed group profit is £101,898, compared with £62,560 a year ago. There is a final dividend of 17½%, making a total of 25% on capital which was increased by a 100% free issue last year.

T. Clarke and Co. Ltd.

The directors propose to make a two-for-seven rights issue at a price of 40s. per share.

Dowding and Mills Ltd.

Trading profit for the year ended 30 June last is £104,744 (*£79,786*), and the net profit after taxation, £33,026 (*£24,439*). Mr K. H. Sharp, the chairman, states that the London factory is still increasing its turnover but is not yet on a satisfactory profit-making basis. It is hoped that the current year will show profit on that venture for the first time. The directors are considering extending the present Camp Hill factory, and of rebuilding the office block there, which is proving inadequate.

Globe Telegraph and Trust Co. Ltd.

The directors propose to issue the balance of the authorised capital — 1,117,799 Ordinary £1 shares. About 1,109,200 will be offered by way of rights at par to Ordinary holders on the basis of two for each £7 of Ordinary stock.

Heenan and Froude Ltd.

With a final dividend of 12½%, the total distribution for the year ended 28 Aug. last is raised to 17½%, compared with 15% last year. The group net profit for the period, after taxation, is £167,228 (*£153,325*).

Kenwood Manufacturing Co.

It is stated that Ocean Trust has placed privately £100,000 7% Notes. The money will be required for factory extensions and development.

Perak River Hydro-Electric Power Co.

Increased revenue resulted from the sale of a record number of units (335·1 millions) during the year ended 31 July last. Further indication that the situation in the Malay tin fields is improving, is shown by the data in the accompanying table. The company also controls the Kinta Electrical Distribution Co., Ltd., which made a trading profit of £52,079 (*£59,508*) over the same period. At the annual meeting last Thursday Mr H. G. Balfour, the chairman, said returns for the current financial year to date were satisfactory and in the absence of any unforeseen circumstances there seemed to be no reason to expect the next account to be less reasonable.

Year to 31 July	£ Revenue	£ Net Profit	% on Ord. Earned	% on Ord. Paid	Ord. Price High	Ord. Price Low
1950	971,338	147,029	12	—	12/6	7/6
1951	1,138,781	164,201	14	—	14/–	8/3
1952	1,266,709	132,777	11	—	15/–	10/9
1953	1,385,190	159,117	13	6	17/10	13/7
1954	1,449,571	233,651	21	10	16/–	13/6

Peter Brotherhood Ltd.

Application is being made to the Capital Issues Committee for consent to a one-for-one scrip issue.

J. and F. Stone Lighting and Radio Ltd.

Although the figures for the year ended 30 June last, were again a record, Mr D. G. Nairn, the chairman emphasises that these were achieved although hire purchase trading restrictions operated throughout the year. The h.p. relaxations have been operative since that date. He states that the current year's trading is away to a good start and a very substantial amount of business has been undertaken since 1 July. Current assets listed in the full report and accounts at £2,488,000 exceed the whole of the company's liabilities, including future taxation, by £676,000. Amounts receivable under hire-purchase agreements are listed at £308,615 compared with £395,764 a year earlier, reflecting the extension of credit sale facilities as an alternative to restricted hire-purchase.

Year to 30 June	£ Trading Profit	£ Net Profit	% on Ord. Earned	% on Ord. Paid	Ord. Price High	Ord. Price Low
1950	412,077	148,389	62	40	20/3	14/10
1951	515,054	170,420	75	40	18/10	14/–
1952	570,233	168,996	75	40	16/10	11/6
1953	761,900	183,014	82	50	28/9	14/4
1954	895,261	252,582	76	50*	37/6	18/4

*Plus 50% capital bonus.

Yarrow and Co. Ltd.

Group net profit for the year to 30 June last is £143,900 (*£105,544*), after providing for taxation, and £60,000 (*same*) for additions and improvements. The dividend is 17½% on capital increased by 50% free scrip issue.

Dividends Declared

Brush Group. Interim of 3%. Last year no dividend was paid but the final was 6%.

Falk, Stadelmann and Co. Final dividend 5%, making a total of 15%.

Mexican Light and Power Co. Common dividend of 25 cents per share (Canadian currency).

E. Shipton and Co., (Holdings). Interim of 10%.

Ward and Goldstone Ltd. Interim of 10% (*15%*) on doubled capital.

G. and J. Weir Ltd. Interim of 7½% (*5%*).

COMMERCIAL INFORMATION

Contracts Open at Home . . .

Dates given are the final for receipt of tenders unless otherwise stated.

13 Nov.—E. Lothian. Electrical work in reconstruction of Clark Buildings, Ormiston.—See 28 Oct. issue.

13 Nov.—Peterborough T.C. Installations in 48 houses on Eastfield estate.—Advertised in 4 Nov. issue.

15 Nov.—Dundee. Rewiring etc. at King's Cross Hospital. Applications to Regional Engineer, Eastern Regional Hospital Board, 430 Blackness Rd.

15 Nov.—Dublin T.C. Installation in Technical School for Boys in Collins Ave.—See 28 Oct. issue.

15 Nov.—Edinburgh. Maintenance work at five institutions during 1955.—See 28 Oct. issue.

16 Nov.—Co. Down. Electrical installation in 42 houses at Creggan and 34 at Warrenpoint. N. Ireland Housing Trust, 12 Hope St, Belfast. Deposit 10s. for each scheme.

16 Nov.—Hazel Grove and Bramhall U.D.C. Concrete and steel columns, lanterns, etc., along Buxton and Macclesfield Rds.—Advertised in 14 Oct. issue.

17 Nov.—Co. Armagh. Installation in 32 houses at Markethill.—See 4 Nov. issue.

17 Nov.—Kincardine. Street lighting for Silverbank estate.—See 21 Oct. issue.

18 Nov.—Belfast T.C. Extensions to pneumatic dust removal and surface installation at Power Station West.—Advertised in 14 Oct. issue.

18 Nov.—Dublin. Installation at outpatients' dept. of National Children's Hospital.—See 4 Nov. issue.

18 Nov.—Lichfield T.C. Steel columns, brackets, sodium and fluorescent lanterns for Group A lighting along A.51.—Advertised in 28 Oct. issue.

20 Nov.—Eire. Gt. Northern Railway Board requires supplies during 1955.—See 4 Nov. issue.

20 Nov.—Hamilton T.C. Electrical equipment for old people's home, "Balgreen." Apply by above date to J. Kelly, Town Clerk, The Town House.

22 Nov.—Longbenton U.D.C. Supply and erection of 26 sodium vapour street lighting units on concrete columns along A.1 at Seaton Burn. A. E. Sweetman, Engineer and Surveyor, Council Offices, Forest Hall, Newcastle-on-Tyne. Deposit £2. 2s.

22 Nov.—Manchester T.C. Electrical installation at Queen's Park Branch Library, Rochdale Rd. City Architect, P.O. Box 488.

22 Nov.—Newport (I.o.W.) T.C. Supply, erection of 31 group B 150 W lamps with concrete columns for public lighting. Borough Engineer, 39 Quay St.

23 Nov.—Co. Tyrone. Stand-by generating set at Loughry Agricultural College, Cookstown.—See Nov. 4 issue.

24 Nov.—Co. Down. Electrical services at Donaghadee intermediate school.—See 28 Oct. issue.

24 Nov.—Littlehampton U.D.C. Installation in 12 houses on Wickbourne estate.—See 21 Oct. issue.

26 Nov.—Dublin T.C. Supply of mercury vapour lamps for public lighting dept. Finance Dept., City Hall.

26 Nov. Manchester T.C. Electrical installations in (a) 80 houses, etc. at Langley estate, (b) 12 aged persons' dwellings at Hillside estate, and (c) 55 houses, etc., at Heaton Park Rd. Director of Housing, Town Hall, Manchester, 2—Advertised in this issue.

26 Nov.—Runcorn R.D.C. Supply and installation of concrete columns and brackets, auxiliary gear, etc., for group A mercury vapour or fluorescent lighting along trunk roads A.50 (1,800 yds) and A.49 (800 yds). Engineer and Surveyor, Castle Park, Frodsham, via Warrington. Deposit £2. 2s.—Advertised in this issue.

27 Nov.—Reigate T.C. Supply and erection of street lighting equipment along Guildford-Maidstone Rd (A.25). Borough Surveyor, Town Hall.—Advertised in this issue.

29 Nov.—Barnsley T.C. Supply of standards and equipment for group A street lighting improvement schemes. Borough Engineer, Town Hall.—Advertised in this issue.

29 Nov.—Belper U.D.C. Supply, erection, wiring 27 concrete columns and six brackets with auxiliary gear in group A for sodium street lighting along A.6. J. Lawson, Engineer and Surveyor, Council Offices, King St.

29 Nov.—Bletchley U.D.C. Concrete columns and 3-light fluorescent lighting units.—See 4 Nov. issue.

29 Nov.—West Lothian. Provision of street lighting installation along A.9 at Linlithgow Bridge. County Sanitary Inspector, 212 High St.

30 Nov.—Tottenham B.C. Lamps wanted in year from 1 Apr.—See 14 Oct. issue.

2 Dec.—Forres T.C. Supply and erection of 44 steel columns, 2 brackets and 47 140 W sodium vapour discharge lamps etc. for group A lighting along A 46. Burgh Surveyor, Town Hall.

4 Dec.—Higham Ferrers T.C. Supply, installation 44 street lighting units along trunk road A.6. F. W. Drury, surveyor, Town Hall.

6 Dec. Slough T.C. Supply and erection of 74 group "A" street lighting columns and 400 W mercury vapour lamps with aero-screened lanterns at London Rd. Borough Engineer, Town Hall, Slough. Deposit £2. 2s.—Advertised in this issue.

10 Dec.—Tiverton (Dev.) R.D.C. Supply and installation of mercury discharge class A lighting, including columns, brackets and auxiliary control gear, along Exeter-Leeds trunk road A.38. R. L. Pugsley, clerk, The Great Hse, St. Peter St.—Advertised in this issue.

13 Dec.—Manchester T.C. Supply of overhead electric-driven cranes and electric hoists, electric clocks, wiring and lighting installations, space heating installation, for Davyhulme sewage works extensions. City Surveyor, Town Hall. Deposit £1. 1s.

No date stated.—N. of Scotland H.E. Board. 11 kV and lower voltage woodpole o.h. lines in N. Perthshire.—Advertised in 4 Nov. issue.

. . . and Overseas

*Details of items marked * may be obtained on application to the Board of Trade, Lacon House, Theobalds Rd, W.C.1, quoting reference.*

23 Nov.—Philippines. Transformers, switchgear, accessories and spares for Beckel substation. Documents from General Manager, National Power Corpn., P.O. Box 2123, Manila, at ten pesos per set. B.o.T. (Ref.: ESB 25229/54.)*

2 Dec.—Uruguay. Supply of 12,000 mts 6,000 V armoured cables and accessories for Usinas Electricas y los Telefonos del Estado. B.o.T. (Ref.: ESB 25576/54).*

3 Dec.—South Africa. City of Durban Corpn. requires 13,100 yards of ·25 sq in. cross section 33 kV "H" type cable LAS 3-core with either shaped or circular conductors. Tender no. E.2500. B.o.T. (Ref.: ESB 25156/54).*

Your Queries Answered

Readers are invited to make use of our free enquiry department which possesses wide resources including an index of trade information with over 100,000 entries

A Selection from the 131 queries answered this week

"Ceres" oven lamp, makers of? E.B.—Ellerstyle Eng. Co., Ltd., 12 Colebrooke Place, N.1.

"Donlok" plugs and sockets, makers of? A.W.—Donovan Electrical Co., Ltd., Northcote Rd, Stechford, Birmingham 9.

"Igema" indicators, makers of? A.E.R.—James Gordon and Co., Ltd., Dalston Gdns, Stanmore.

Devices for taking a chair-borne invalid up a flight of stairs, addresses for? J.T.C.—R. G. Paine, 11 Maidstone Rd, Rochester, Kent; Stanley Eng. Co., Ltd., 11 Gerrard St, W.1.

"Hotlock" food conveyors, address for? W.E.B.—Food Conveyors Ltd., 18 Manor Rd, Nth Hinchley Wood.

"G.I." clocks, suppliers of? L.O.—Neville Brown and Co., Ltd., 77 Newman St, W.1.

"Enbeeco Magnalite" illuminated magnifying glass, makers of? T.B.—Newbold and Bulford Ltd., Enbeeco Hse, Roger St, W.C.1.

"Acfil" battery fluid pumps, makers of? M.C.C.—E. M. Francis Ltd., Mortimer Hse, Hadstock Rd, Linton, Cambridgeshire.

6 Dec.—India. Additional outdoor and indoor switchgear equipment for Bellory 66 kV substation for Govt. of Andhra's Dept. of Electricity. B.o.T. (Ref.: ESB 25519/54).*

6 Dec.—Tangier. Water and Electricity Board require modifications of h.t. outlets ("Sorties") at Moghogha power station. Regie des Services de l'Eau et de l'Electricite, Rue Vermeer, 4, Tangier. B.o.T. (Ref.: ESB 25075/54).*

8 Dec.—Australia. Supply of one (or two) 18,000 kW water-driven turbo-alternator, 11,000 V 3-phase, 50 c/s head approx. 1,485 ft., for Cairns Electricity Board. Specifications T8/19 at £3. 3s. per copy from State Electricity Commission of Queensland, Eagle St, Brisbane.

9 Dec.—South Africa. Supply of total of 39,000 ft electric cable to various specifications for Stores Dept, S. African Railways, Johannesburg. Tender no. C8451. B.o.T. (Ref.: ESB. 25334/54).*

15 Dec.—Australia. Victorian Railways Commissioners invite tenders for supply of eight 1,500 kW automatically-controlled rectifier units. Contract No. 60268. B.o.T. (Ref.: ESB 24947/54).*

16 Dec.—Australia. State Electricity Commission of Western Australia invites tenders under schedule 498 A for two 3,000 kVA 22,000/3,000 V transformers and two 1,000 kVA 3,000/440 V auxiliary transformers, oil immersed, outside installation, 3-phase 50 c/s for East Perth and South Fremantle power stations: and under schedule 499 A for 10 air circuit-breakers, rupturing capacity 23,000 A, two 1600 A, and two 400 A, off-load isolators and 14 H.R.C. switch-fuse units, 400 V, 3-phase, 40 c/s for East Perth power station. Documents from Govt. Liaison Officers, 305 Collins St, Melbourne, and 82 Pitt St.

16 Dec.—Philippines. Two hydraulic turbines, two governors, and/or two generators, one power transformer, switchgear and station service equipment for Loboc River Hydroelectric project. Documents from General Manager, National Power Corpn., P.O. Box 2123, Manila, at five pesos per set. B.o.T. (Ref.: ESB 25228/54).*

2 Jan.—India. Supply, erection and maintenance of 3,000 V overhead equipment on Howrah-Burdwan main line for total of about 260 miles. Calcutta Electrification Project, Eastern Railway, Calcutta. B.o.T. (Ref.: ESB 24053/54).*

6 Jan.—India. Supply of cables taped braided and compounded 250 V and 660 V grade insulated with vulcanised india rubber. Director General of Supplies and Disposals, Shahjahan Rd, New Delhi. B.o.T. (Ref: ESB 25527/54).*

7 Jan.—India. Director General of Supplies and Disposals, Shahjahan Rd, New Delhi, requires supply of armoured railway signalling cable 660 V grade conductors. B.o.T. (Ref.: ESB 25526/54).*

Contracts Placed

Blyth. Wiring in 220 Coal Board houses in Malvins Close, A. Hagerty.

Cottingham (Yorks). Installation of underground cables and street lighting at Castle Hill Hospital, T. A. Garness Ltd., £2,622.

Hull T.C. Light and power installation in 72 flats at Porter St, The Reliance Electrical Co.

Manchester T.C. Installation in 98 flats and maisonnettes at Woodhouse Park, Lindsay Crawford Engineering Ltd.

Plymouth. Installations on Chaucer Way and Manadon Vale estates, Madge and Son, £1,676.

PRICES of cable metals and other materials

Figures quoted are the official prices ruling on Tuesday, 9 November

	£ per ton	Weekly change £	Price last year £
COPPER, standard class A (settlement)	280	—	238
,, (3 months)	265	+4½	221½
LEAD, refined pig, min. 99·97% purity (cash)	110½	+2½	93½
,, (3 months)	105½	+2½	90
TIN, refined, min. 99·75% purity (settlement)	719½	−11½	615
,, (3 months)	717½	−10½	607½
ALUMINIUM, ingots 99-99·5%	150	—	150
ZINC, virgin, min. 98% purity (cash)	81½	−½	75½
,, (3 months)	81½	+⅜	74½
RUBBER No. 1, RSS, spot (per lb.)	26½d.	+3/32d.	17d.
,, c.i.f. basis, ports, Dec. (per lb.)	24 1/32d.	+1/32d.	17½d.
ARMOURING:			
Galv. Steel Wire (0·104 in.)	52½	—	50½
Mild Steel Tape (0·014 in.)	40½	—	40

NEW COMPANIES

Extracted from the Register issued by Jordan and Sons, Ltd., 116 Chancery Lane, W.C.2.

R. J. and A. J. Beasant Ltd. To take over business of manufacturers and sellers of the electric battery improver known as "Batlife" carried on by Richard J. Beasant and Arthur J. Beasant, at Challow Marsh, Wantage, Berks. Nom. cap.: £200. Dirs.: R. J. Beasant and A. J. Beasant.

Alexander Electrical Co., Ltd. 10 Calvert Ave, E.2. To take over business of Gordon J. Alexander carried on at Calvert Ave, E., manufacturers of and dealers in wireless and radio sets, etc. Nom. cap.: £2,000. Dirs.: G. J. Alexander and M. Hershman.

Riviera Electric Ltd. Ladrisse, Coombe Cross Hill, Ideford, near Newton Abbot, Devon. Electrical engineers and contractors and electrical equipment specialists, etc. Nom. cap.: £100. Dirs.: J. W. Neal and R. E. Holder.

Essex Electrical Service (Alresford) Ltd. Colchester Rd, Alresford, Essex. Nom. cap.: £4,000. Dirs.: E. F. A. Watts and F. J. A. Watts.

United Air Coil Ltd. 115 Alexandra Park Rd, Muswell Hill, N.10. Manufacturers and/or distributors of air conditioning equipment, etc. Nom. cap.: £100. Permt. dir.: Capt. G. S. Sessions.

Atkinson Electrical and Engineering Co., Ltd. Commercial Rd, Penryn, Cornwall. To take over the Penryn branch of business of industrial electrical engineers carried on at Commercial Rd, Penryn by Industrial Electrical Co.; electrical, mechanical, motor and general engineers, etc. Nom. cap.: £20,000. Dirs.: J. M. Horsley and T. Atkinson.

Warbro Products Ltd. 5 Peartree Rd, Enfield, Middx. Manufacturers of and dealers in industrial and domestic appliances for use with coal, gas, electricity, oil or otherwise, etc. Nom. cap.: £500. Dirs.: A. J. C. Ward, and C. H. Fox.

T. T. Reedy (1954) Ltd. 173 St. Albans Rd, Watford, Herts. Wireless, television, electrical, motor, refrigeration, lighting, telephone, mechanical and general engineers and contractors, etc. Nom. cap.: £1,000. Dirs.: F. A. J. Wells, J. P. Stott, Mrs D. L. Northway and Mrs M. E. Wells.

Church Electric Ltd. Kings Chambers, 29/31 Portugal St, W.C.2. Dealers in and agents for radio and television sets and all types of electrical appliances, etc. Nom. cap.: £2,000. Dirs.: R. N. Bygrave and Mrs J. E. Bygrave.

Precision Electronic Terminations Ltd. Offices of Benjamin Kay and Brummer, 57 Blandford St, W.1. Manufacturers of and dealers in engineering, plastic, scientific, optical, electrical and electronic products of all kinds, etc. Nom. cap.: £1,000. Dir.: E. D. Bintcliffe.

Walton Testing Equipment Co., Ltd. 14 Silver St, Tetbury, Glos. To take over business of electrical test equipment manufacturers carried on as J. H. D. Walton and Co., at Tetbury, Glos. Nom. cap.: £2,000. Dirs.: J. H. D. Walton and Patricia A. Walton.

Airedale Engineering Co., Ltd. Aladdin Works, Silsden, nr. Keighley. Textile machinists, manufacturers of electrical fittings and machinery, etc. Nom. cap.: £5,000. E. A. Gostling signs as director.

Rubert and Co., Ltd. Chapel St, off Stockport Rd, Levenshulme, Manchester. Precision and electrical engineers, machinists and turners, etc. Nom. cap.: £1,000. Dirs.: M. P. Rubert, Mrs E. Rubert, and E. C. Smith.

Speed Electric Service (Stoke-on-Trent) Ltd. 26 Hillchurch St, Hanley, Stoke-on-Trent. Electrical, wireless, telephone, lighting, heating, motor, mechanical and general engineers, etc. Nom. cap.: £3,000. Permt. dirs.: D. F. Goring, Lilian M. Goring, and Mrs P. A. Shaw.

H. Wilkinson and Sons (Electrical) Ltd. 56a Cold Bath Rd, Harrogate. Electrical engineers and general electrical installation contractors, wireless and television engineers, etc. Nom. cap.: £2,000. Permt. dirs.: H. Wilkinson, F. Wilkinson, G. Wilkinson, W. Wilkinson and A. Wilkinson.

Lyndock Electrical Products Ltd. 10 Portsmouth Rd, Woolston, Southampton. To enter into an agreement with Alexr. Orba, Albert V. W. Allcorn, J. C. Buckle and Chas. G. Kennedy, electrical equipment specialists, etc. Nom. cap.: £1,500. Dirs.: A. Orba and C. G. Kennedy.

Rad-Fire Ltd. 43 Trinity Sq, Margate, Kent. To take over interest in British Patent No. 636,942, and any other patents, brevets d'invention and the like; manufacturers of and dealers in electrical, gas and oil fires, etc. Nom. cap.: £250. Dirs.: H. V. Tooley, Christina Tooley, and E. E. B. Vereker.

Wainwrights (Manchester) Ltd. 100 London Rd, Manchester. Electrical engineers and contractors, etc. Nom. cap.: £1,000. Dirs.: N. P. Howarth and E. Warburton.

BUSINESS PROSPECTS

Home

Alloa. Dean of Guild Court has approved erection of additional office accommodation at The Whims, for N.C.B.

Amble U.D.C. Construction of 23 houses in Leslie Drive. Surveyor, A. Livesey, Council Offices.

Armagh. Plans in hand for £185,000 admission block at St Luke's Hospital.

Basildon. Aviation Traders Ltd., 15 Gt Cumberland Place, W.1, are negotiating for erection of 100,000 sq ft factory. Building to begin early next year.

Bebington (Ches.). Architects for new Town Hall are Willink and Dod, Cunard Buildings, Liverpool 3.

Belfast. Circuits Management Assoc. Ltd., 5 Bainbridge St, London, W.C.1, to erect Odeon Cinema in Castle St. Quantity surveyors are L. C. Wakeman and Partners, 47 Bloomsbury Sq, W.C.1.

Bradford T.C. Some £439,000 to be spent on new housing estates. These include 101 flats and 10 shops in 8-storey block at Thorpe Edge; 66 houses at Eccleshill South; and 62 houses at Allerton. It is also proposed to build 48 houses in Squire Lane.

Bridgnorth (Salop). Star Aluminium Co., Ltd, Wolverhampton, to build new factory and work will begin in three months time.

Brighton T.C. Erection of 180 three-storey flats and 64 houses on Bristol Gate estate; and of three-storey block of 18 flats in Eastern Rd. Borough Engineer and Surveyor, 26-30 King's Rd. Also construction of 48 flats on Hollingbury estate by James Miller and Partners Ltd, builders.

Cardiff T.C. Construction of new county secondary school at Heol Hir, Llanishen. E. R. Budgen and Partners, quantity surveyors, 117 St Mary St.

Chelmsford R.D.C. Erection of 81 houses in Burnthouse Lane, Ingatestone. Council's Estates Manager, Council Offices, New London Rd.

Chester-le-Street R.D.C. It is proposed to erect 227 houses and bungalows at Birtley.

Chislehurst and Sidcup (Kent) U.D.C. Construction of block of 24 flats in Elmstead Lane, Chislehurst, and/or block of 10 flats in Palm Ave, Footscray. T. W. Fagg, clerk of council, Council Offices, Sidcup.

Co. Down. Erection of 79 houses at Newcastle. N. Ireland Housing Trust, 12 Hope St, Belfast.

Consett (Dur.). Memorial Hall designed by local trade unionists to be erected in two stages in John St. Sketch plans prepared and cost estimated at £70.000.

Denton U.D.C. Erection of 44 houses on Dark Lane Farm site. Engineer and Surveyor, Town Hall, Denton, nr. Manchester.

Durham. Architects for new wing at St Hilda's College are Cordingley and McIntyre, The College, Durham.

Ealing. Layout plans in hand for erection of 232 dwellings on Northolt Park estate.

East Grinstead. Bus garage proposed by Southdown Motor Services Ltd. Architects are Clayton and Black and Davies, 10 Prince Albert St, Brighton.

Greenwich. L.C.C. recommended to approve renewal of electrical installation in pedestrian tunnel. Cost estimated at £3,550.

Hartlepool T.C. It is proposed to erect 76 houses off King Oswy Drive.

Hatfield (Herts.) R.D.C. Approval granted for erection of 30 houses and 26 bungalows at Walham Green. Development Corporation's layout and plans for erection of 369 houses have also been approved. Erection of £70,000 factory planned by Die Casting Machine Tools Ltd. Architects are Barnes, Challen and Cross, 96 Gloucester Place, W.1.

Hereford. First instalment costing £116,000 of college of further education has been approved. Total cost of scheme, £411,000.

Hexham R.D.C. Twenty-six houses to be built at Haydon Bridge and work will probably start in spring.

High Wycombe. Brocklehurst and Cooper, 11a Crenden St, are architects for factory proposed by Stephens and Carter Ltd, on Cressex industrial estate.

Kesteren. First instalment of secondary modern school for Deeping area to be included in 1955-56 school programme.

Longford (Eire). Erection of new county hospital has been approved.

Luton. Construction of technical school during 1954-55 has been approved.

Middlesbrough. Allen and Hill, Tankerville Terr., Newcastle-on-Tyne, are quantity surveyors for proposed Town Farm R.C. secondary school. £10,000 scheme approved for additional storey at fire station. Sketch plans approved for proposed Berwick Hills nos 2 and 3 county primary schools.

Newcastle-on-Tyne. Scheme being considered for further expenditure at Municipal Airport. Included in project is spending £180,000 for hangars to take larger aircraft, and £107,364 for new building with control rooms, offices, etc.

Newcastle-on-Tyne. George Angus and Co., Ltd, Westgate Rd, propose to build £250,000 factory at Tyne Quarry, Walker Rd.

North Riding. Primary school to be built at Eastfield, Scarborough. Quantity surveyors are Davies, Bellfield and Everet, 9 Ashley Place, Westminster.

Penrith U.D.C. Plans approved for garage, showroom and service station in King St. for Armstrong and Flemming, King St.

Rhondda (Glam.) U.D.C. It is proposed to erect 75 houses on Trebanog site and 52 on Richard St site, Maerdy.

Spennymoor (Dur.) R.D.C. Application to borrow £132,848 to be made to erect 100 houses on Middlestone Moor site.

Tewkesbury. County primary school has been included in 1955-56 programme.

Thurles (Co. Tipperary) U.D.C. Erection of 36 houses at Loughtagalla. E. F. Murphy, town clerk, Council Offices.

Walthamstow. British Xylonite Co., Ltd, propose to build factory at Halex Works, Larkshall Rd.

Westmeath. Construction of 52 houses at Springfield, Mullinger. P. J. Swords, acting County Secretary, County Buildings, Mullinger.

Overseas

U.S.A. Hamilton Watch Co., (Allied Products Div.), Lancaster, Pennsylvania, would like to make arrangements with U.K. manufacturers for manufacture and sale under licence in U.S. of precision electrical and mechanical instruments.

Carey and Gordan, 919 St Paul St, Baltimore, Maryland, wish to represent, on commission basis, a U.K. firm manufacturing steel forgings and electrical hardware for h.v. transmission lines.

Gazette Announcements

COMPANIES ACTS

Fairclough (Leeds) Ltd. Supplemental dividends of 2½d. in £ payable on 18 Nov. at Official Receiver's Office, 29 East Parade, Leeds.

Barton's (Radio) Ltd. Resolution for voluntary winding-up passed at meeting on 27 Oct. Bernard Philips, 76 New Cavendish St, London, W.1, has been appointed liquidator and creditors are asked to send particulars to him by 30 Nov.

Companies Winding-up

Denglow Ltd. At first meeting of creditors Official Receiver said company was formed in Mar. 1947, with nominal and issued capital of £100. Business commenced in 1944 manufacturing neon signs, and two years later another business formed to fit the signs. Early in 1947 a third party offered to finance business and company was formed. Company was mainly engaged in manufacture of starter fittings. In 1951 it obtained a contract for 250,000 lamp bulbs, but after 50,000 had been delivered customer cancelled order on the grounds that bulbs were inferior. During 1952 and 1953 company encountered competition in manufacture of starter switches and prices were reduced. Prices had to be reduced again this year to meet further orders and it became more and more difficult to meet creditors claims. Judgments were obtained against company which was followed by winding-up order. No statement of affairs had been filed but liabilities had been estimated at £2.000. Official Receiver had received £150 from sale of plant, effects and stock in trade, and further £40 was expected to be realised from other sources. No resolution was passed and matter was left in hands of the Official Receiver as liquidator.

BANKRUPTCY ACTS

Release of Trustee

Chester. Frederick E. L. Hester, electrical contractor trading at 9 Coal Exchange, Black Diamond St. Trustee was A. K. Ferguson, Official Receiver, West Africa Hse, 25 Water St, Liverpool.

Intended Dividends

Plymouth. James H. Trevithick, electrician trading in partnership with Power Light and Sound at 51 Fore St, Callington, Cornwall. Last day for receiving proofs, 19 Nov. Trustee is F. B. Goodman, Official Receiver, 24 Lockyer St, Plymouth.

Application for Discharge.

Wandsworth. Harry Turner, radio and electrical contractor of 20 Battersea Rise, Clapham Common. Hearing fixed for 10.30 a.m. on 8 Dec. at Court Hse, Garratt Lane, S.W.18.

Appointment of Trustee.

London. Alexander Jager, electrical engineer, formerly of 64 Cholmley Gdns, N.W.6, and 408 Edgware Rd, W.2. Trustee is B. Phillips, cert. acc., 76 New Cavendish St, W.1.

MEETINGS TO NOTE

THURSDAY, 11 NOV.

I.E.E. (London). "Overhaul and Maintenance of D.C. Traction Motors," J. G. Bruce. Savoy Place, W.C.2, 5.30 p.m.

I.E.E. (N. Scotland). "Electricity in Wool Textile Industry." Univ. College, Dundee, 7 p.m.

I.E.E. (Swansea). "Safety in Use of Portable and Transportable Electrical Equipment in Industry," J. W. Bunting. Elect. Showrooms, The Kingsway, 6 p.m.

I.E.S. (Birmingham). Ladies' Night at Botanical Gardens Ballroom, Westbourne Rd, Edgbaston.

I.E.S. (Manchester). "Street Lighting Costs," T. L. Robinson. Elect. Offices, Town Hall, 6 p.m.

DERBY ELECTRICAL SOC. "Industrial Photography," E. J. Grimswade. Elect. Showrooms, Irongate, 7 p.m.

E.I.B.A. (W. Lancs, Mersey and N. Wales). Annual buffet dance at Hotel Victoria, New Brighton.

INCORP. PLANT ENGRS. (Newcastle). "Industrial Lubrication," N. Errington. Roadway Hse, Oxford St, 7 p.m.

BRITISH INSTN. OF RADIO ENGRS. (Scottish). "Nuclear Fission and Nuclear Fusion," Prof N. Feather. The University, Edinburgh, 7 p.m.

ROYAL STATISTICAL SOC. (Industrial Applic Group—Glasgow). "Use of Random Observations to increase Productivity," J. H. Hepburn. 39 Elmbank Cres, 7.30 p.m.

FRIDAY, 12 NOV.

I.E.E. (Tees-side) Annual dinner at Zetland Hotel, Saltburn, 6.30 p.m.

I.E.E. (N. Ireland). "Owen Falls, Uganda Hydro-Electric Development—General Aspects," Sir Charles Westlake, J. A. L. Paton and R. W. Mountain. Queen's Univ., Belfast, 6.30 p.m.

I.E.E. (Swansea). Annual dinner and dance at Langland Bay Hotel, Mumbles.

E.P.E.A. (Meter Engrs. Group). "Principle of the Current Transformer," A. Hobson. Caxton Hall, Westminster, 6.30 p.m.

ELECT. TRADES COMMERCIAL TRAVELLERS' ASSOC. (Midlands). Annual dinner at Queens Hotel, Birmingham.

JNR. INSTN. OF ENGRS. (London). "Corrosion," W. F. Gerrard. Pepys Hse, 14 Rochester Row, S.W.1, 7 p.m.

MONDAY, 15 NOV.

I.E.E. (London). Discussion "Has Nuclear Fission a Future as a Source of Industrial Power?" Sir Harold Roxbee Cox. Savoy Plce, W.C.2. 5.30 p.m.

I.E.E. (Mersey and N. Wales). "Technique and Development of Automatic Winding in Mine Shafts," B. L. Metcalf and G. Cuttle. Town Hall, Chester, 6.30 p.m.

I.E.E. (N.E. Radio and Measurements). "A.C. Instrument Testing Equipment," A. H. M. Arnold. King's College, Newcastle, 6.15 p.m.

BIRMINGHAM ELECTRIC CLUB. "Electrical Engineering in the Steel Tube Industry," Maj H. E. Knight. Grand Hotel, 6.15 p.m.

PUBLIC WORKS AND MUNICIPAL SERVICES CONGRESS AND EXHIBITION Opens today at Olympia, London, and closes on 20 Nov.

MEDICAL EXHIBN. 37th Display at New Horticultural Hall, London, continues until 19 Nov.

TUESDAY, 16 NOV.

I.E.E. (London). Celebration of Jubilee of Thermionic Valve.

I.E.E. (London Students). "Automatic Control of Electrical Machines," R. Molloy. Public Library, Chelmsford, 7 p.m.

I.E.E. (N. Midland) "Measurement of Winding Resistances of 132 kV Power Transformer in Service," K. J. R. Wilkinson and J. D. Harmer. Electricity Offices, 1 Whitehall Rd, Leeds, 6.30 p.m.

I.E.E. (N.W. Utilisation). Discussion on "Engineering Education—Can It be Improved?" J. F. Yates. Engrs. Club, Albert Sq, Manchester, 6.15 p.m.

I.E.E. (Scotland). Scottish Centre dinner dance in Glasgow.

I.E.E. (Rugby). "Possibilities of Cross-Channel Power Link between British and French Supply Systems," D. P. Sayers, M. E. Laborde and F. J. Lane. College of Technology and Arts, 6.30 p.m.

I.E.S. (Glos. and Cheltenham). "Lighting for Enjoyment," T. O. Freeth, G.E.C., 2 St. Aldate St, Gloucester, 6.30 p.m.

I.E.S. (Liverpool). "Lighting for Production," J. W. Howell. Liverpool Engrng. Soc., 24 Dale St, 6.30 p.m.

INST. OF FUEL (Midland). "Modern Gas Turbine Practice," H. Farrington. James Watt Inst., Great Charles St, Birmingham, 6 p.m.

INCORP. PLANT ENGRS. (S. Wales). "Instrumentation and Thermostatic Controls." S. Wales Inst. of Engrs., Park Place, Cardiff, 7.15 p.m.

A.S.E.E. (London). "Application of Lights for Modern Traffic Conditions." W. A. Dixie. Magnet Hse, Kingsway, W.C.2, 6.15 p.m.

TRADE MARKS

This information is extracted from the Official Journal by permission of the Controller.

Parablock. 731,227. Class 9. Apparatus, instruments, connectors and conductors, British Thomson-Houston Co. Ltd., Crown House, Aldwych, W.C.2.

Mapel. 731,238. Class 9. Electrical apparatus for use in the cathodic protection of metal. Metal and Pipeline Endurance Ltd., 22 Queen Anne's Gate, S.W.1.

Vitricon. 733,382. Class 9. Apparatus and instruments. Welwyn Electrical Laboratories Ltd., Trading Estate, Bedlington St, Northumberland.

Westordair. 731,946. Class 12. Electro-pneumatically operated rail brakes for retarding railway wagons and the like. Westinghouse Brake and Signal Co. Ltd., 82 York Way, King's Cross, N.1.

Heddo H.S. Tape. In design 731,110. Class 17. Insulating tape made of p.v.c. Heddon-Smith (Overseas) Ltd., 374 Euston Rd, N.W.1.

Ferropulser. 732,931 and **Ferrolutor,** 732,932. Class 9. Apparatus for recording, reproducing and amplifying electric oscillations. Wright and Weaire Ltd., 138 Sloane St, S.W.1.

Fleur-de-Lis. 733,388. Class 9. Electrically heated blankets. Thomas French and Sons Ltd., Chester Road Mills, Chester Rd, Manchester 15.

Permionic. 721,167 and **Permaplex** 721,169. Class 11. Water treatment apparatus. Permutit Co. Ltd., Permutit House, Gunnersbury Ave, W.4.

Gallay. B720,156. Class 11. Heaters for motor cars, aircraft and watercraft. Delaney Gallay Ltd., Vulcan Works, Edgware Rd, N.W.2.

TRADE NOTES

New London office. Ether Ltd. have opened a London office at Stamford House, 2/4 Chiswick High Road, W.4. Telephone: CHIswick 7829 and 7949.

Agencies. C. D. Falcke and Partners, 119 Bishopsgate, London, E.C.2 (Telephone Avenue 2125) announce they now hold the following agencies: Siemens-Schuckert (G.B.) Ltd., (part London and the Home and Eastern Counties); Early Crops (Electrical) Ltd., (London and Home Counties); Partridge Wilson and Co. Ltd., and Ega Electric Ltd., (Eastern Counties).

WEDNESDAY, 17 NOV.

I.E.E. (Sheffield). "Safety in Use of Portable and Transportable Electrical Equipment in Industry," J. W. Bunting. Grand Hotel, 6.30 p.m.

I.E.E. (Southern). "Maintenance and Operation of 132 kV Grid Supplies," P. S. Vick. R.A.E. Tech. College, Farnborough, 7.30 p.m.

I.E.S. (Leeds). "Industrial Colour-matching Problems," A. Wilcock. Elect. Offices, 45 Sunbridge Rd, Bradford, 6.15 p.m.

I.E.S. (N. Lancs). "Sense of Sight," S. Mountain. Elect. Offices, 19 Friargate, Preston, 7.15 p.m.

I.E.S. (Tees-side). "Lighting Aids for Marine Navigation," K. C. Sutton-Jones. Cleveland Inst., Middlesbrough, 6.30 p.m.

IRON AND STEEL INST. Annual meeting opens at 4 Grosvenor Gardens, S.W.1, for two days.

INCORP PLANT ENGRS. (Kent). "Fan Characteristics, particularly as regards Boiler Plant," C. E. Knight. Bull Hotel, Rochester, 7 p.m.

INCORP. PLANT ENGRS. (Sheffield). Annual dinner at Grand Hotel.

BRITISH INSTN. OF RADIO ENGRS. (S. Wales). "Techniques of Power Measurements from D.C. to 5 Mc/s," G. F. Lawrence. College of Tech., Cathays Park, Cardiff, 6.30 p.m.

A.S.E.E. (Manchester). "Industrial and Commercial Tariffs." A. S. Verity. Engineers Club, Albert Sq, 7.30 p.m.

A.S.E.E. (Nottingham). "Practical Application of Rectifier Equipments." A. R. Weston. Elect. Showrooms, Smithy Row, 7.30 p.m.

A.S.E.E. (Southampton). Technical Films at Polygon Hotel, 8.15 p.m.

A.S.E.E. (S.W. London). Lecturettes at Guild Hse, Worple Rd, Wimbledon, 8.15 p.m.

THURSDAY, 18 NOV.

I.E.E. (London Utilisation). "Use of Electricity in Production of Calcium Carbide," C. J. Beavis. Savoy Place, W.C.2, 5.30 p.m.

I.E.E. (E. Midland). Centre Buffet Dance at Welbeck Hotel, Nottingham.

I.E.E. (Irish). "Service Experience of Effect of Corrosion on Steel-Cored-Aluminium o.h. Line Conductors," J. S. Forrest and J. M. Ward. Trinity College, Dublin, 6 p.m.

INCORP. PLANT ENGRS. (Blackburn). "Gas Turbines," J. R. Needham. Golden Lion Hotel, 7.30 p.m.

INCORP. PLANT ENGRS. (Mersey and N. Wales). "Factory Act and Plant Engineer," A. Mills, Radiant Hse, Bold St, Liverpool, 7.15 p.m.

A.S.E.E. (Kent). "Relays." Dr W. L. Stern. Royal Star Hotel, Maidstone, 8 p.m.

A.S.E.E. (Watford). Television at Clarendon Hotel, Station Rd, 8 p.m.

FRIDAY, 19 NOV.

I.E.E. (N.E. Students). "D.C. Auxiliary Supplies for Switchgear and Associated Equipment," J. T. Miller. King's College, Newcastle, 6.30 p.m.

DERBY ELECTRICAL SOC. Annual dinner at Grandstand Hotel.

NORTH EAST ELECTRICAL CLUB. Annual dinner.

JNR. INSTN. OF ENGINEERS (London). Chairman's address "Engineering Plant in Buildings," S. G. Clark. Pepys Hse, 14 Rochester Row, S.W.1, 7 p.m.

INCORP. PLANT ENGRS. (E. Midlands). Ladies' evening at Black Boy Hotel, Nottingham.

INCORP. PLANT ENGRS. (Manchester). Annual dinner at Grand Hotel.

I.E.E. (N. Midland). Annual dinner at Queens Hotel, Leeds.

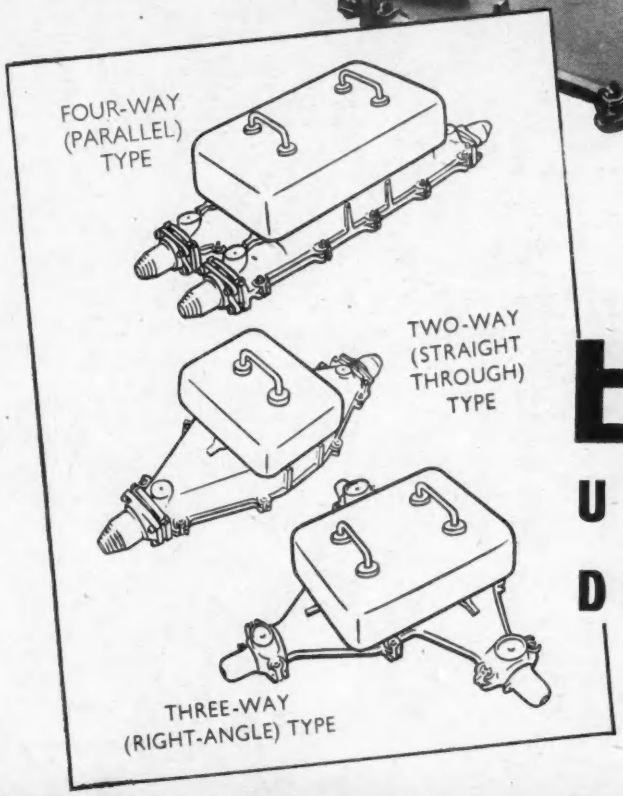
ASSOC. OF ELECT. MACHINERY TRADES. Annual Ball at Savoy Hotel, London, 6.30 p.m.

SATURDAY, 20 NOV.

I.E.E. (Cambridge). District Dinner at Dorothy Restaurant, 7 p.m.

The large numbers of Henley Underground Disconnecting Boxes giving satisfactory service, at home and overseas, is proof of their reliability.

Full details of the wide range available are given in Henley Catalogue 27.

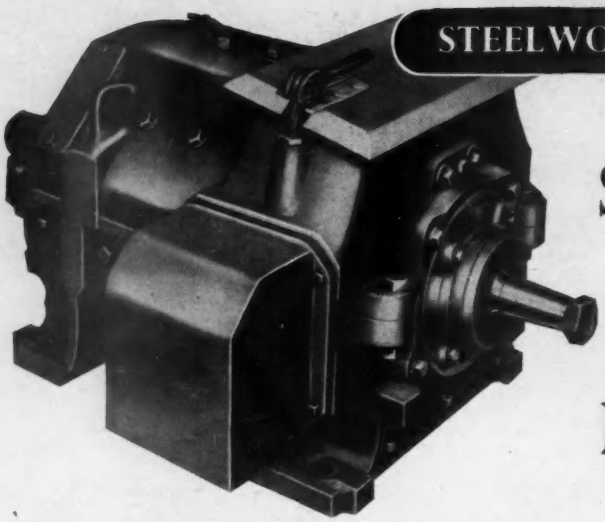


HENLEY

UNDERGROUND DISCONNECTING BOXES

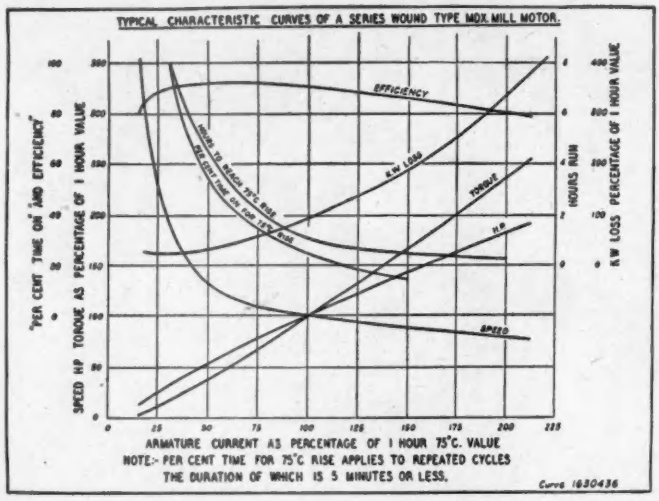
W. T. HENLEY'S TELEGRAPH WORKS CO. LTD., 51-53 HATTON GARDEN, LONDON, E.C.1

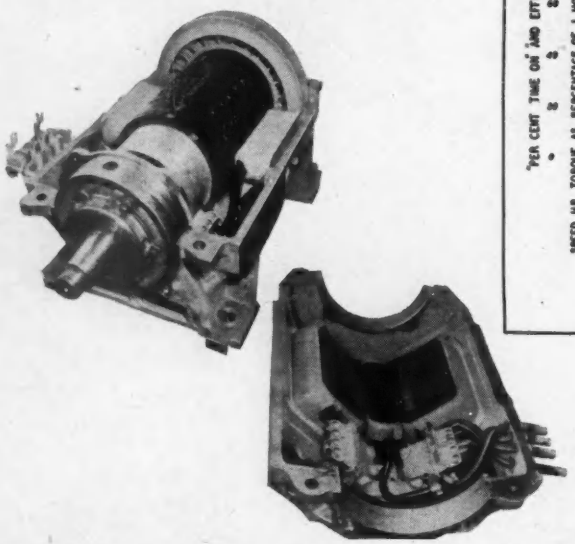
STEELWORKS AUXILIARY MOTORS



STANDARDISED RATINGS & DIMENSIONS

Above: Metrovick type MDX 230-volt d.c. mill motor designed to conform with standard A.A.I.S.E. ratings.
Right: Typical characteristic curves of a series wound type MDX mill motor.


TYPICAL CHARACTERISTIC CURVES OF A SERIES WOUND TYPE MDX MILL MOTOR.
EFFICIENCY
K.W. LOSS
TORQUE
H.P.
SPEED
ARMATURE CURRENT AS PERCENTAGE OF 1 HOUR 75°C. VALUE
NOTE:- PER CENT TIME FOR 75°C RISE APPLIES TO REPEATED CYCLES THE DURATION OF WHICH IS 5 MINUTES OR LESS.
Curve 1630436



All top-to-bottom connections are made outside the machine, so the top half can easily be removed for maintenance purposes. The armature, complete with its bearings enclosed in dust-tight cartridge-type housings, can then be lifted clear of the bottom half of the motor. Feet on the bearing housing support the armature when it is removed from the frame.

Metrovick MDX heavy-duty d.c. motors for auxiliary drives in steelworks are designed to conform with the latest standardised ratings and dimensions (600 series) of the American A.I.S.E. Improved electrical design enables the MDX motor to equal the output of the next larger frame size as compared with the previous range of machines. For details ask for publication SP.7018/1.

METROPOLITAN-VICKERS
ELECTRICAL CO LTD · TRAFFORD PARK · MANCHESTER, 17

J/S301

Member of the A.E.I. group of companies

CLASSIFIED ADVERTISEMENTS

Advertisements should be sent to the Classified Advertisement Dept., Electrical Times, Sardinia House, Sardinia Street, London, W.C.2, before 10 a.m. on TUESDAY of the week of issue. Official Displayed Advertisements are charged at 32s. 6d. per inch, and all other classified advertisements at 2s. 6d. per line. Situations Wanted four insertions at twice the single insertion rate. Fee for Box Number and postage on replies 2s.

TENDERS INVITED

BOROUGH OF REIGATE

CLASS A STREET LIGHTING SCHEME

TENDERS invited for supply and erection of street lighting equipment on lengths of the Guildford-Maidstone Rd (A.25). Specification and general details from Borough Surveyor, Town Hall, Reigate. Sealed Tenders endorsed "Street Lighting" to undersigned by 27 Nov., 1954.

The Council does not bind itself to accept the lowest or any tender.

HEBER DAVIES,
Town Clerk.

Town Hall,
Reigate.
11 Nov., 1954. (N 678)

RURAL DISTRICT OF TIVERTON

STREET LIGHTING—CULLOMPTON. EXETER —LEEDS TRUNK ROAD. A.38

TENDERS are invited for the installation of Mercury Discharge Class A lighting including the supply and erection of Columns, Brackets and Auxiliary Control Gear.

Plans, specifications and forms of tender may be obtained on application to the undersigned.

Tenders enclosed in a plain sealed envelope and endorsed "Street Lighting" must be delivered to the undersigned not later than 12 noon on Friday, 10 Dec., 1954.

The Council do not bind themselves to accept the lowest or any tender.

R. L. PUGSLEY,
Clerk.

The Great House,
St. Peter St,
Tiverton, Devon.
8 Nov., 1954. (N 689)

RUNCORN RURAL DISTRICT COUNCIL

GROUP "A" STREET LIGHTING—TRUNK ROADS

TENDERS are invited for the supply and installation of reinforced or prestressed concrete columns and brackets, lanterns and all auxiliary gear for lighting to Group "A" Standard by horizontal burning Mercury Vapour or Fluorescent lighting equipment on:

(*a*) Trunk Road A.50—Knutsford Rd, Grappenhall (approx. 1,800 yards).

(*b*) Trunk Road A.49—London Rd, Stockton Heath (approx. 800 yards).

Drawings may be inspected and Specification, Bill of Quantities and Form of Tender can be obtained at the office of the Engineer and Surveyor, Castle Park, Frodsham, via Warrington, on payment of a deposit of Two Guineas (£2. 2s.) which will be returned on receipt of a bona fide Tender.

Tenders in plain, sealed envelopes, endorsed "Tender for Street Lighting," must be delivered to the undersigned not later than Friday, 26 Nov., 1954.

The lowest or any Tender will not necessarily be accepted and the Council reserve the right to place separate Contracts for each installation.

R. PATRICK WILLIAMS,
Clerk of the Council.

Council Offices,
Castle Park, Frodsham,
via Warrington. 3 Nov., 1954. (N 659)

CITY OF MANCHESTER

Housing Committee

TENDERS are invited for Electrical Installations on the following sites:

Contract 210E/F—Langley Estate—80 Houses, etc.

Contract 163C—Hillside Estate—12 Aged Persons' Dwellings.

Contract 218—Heaton Park Rd—55 Houses, etc.

Schedules and tender forms may be obtained on application to the Director of Housing, Town Hall, Manchester 2, and must be returned in a sealed official envelope endorsed "Electrical Installations" and be received by the Town Clerk not later than noon on Friday, 26 Nov., 1954.

PHILIP B. DINGLE,
Town Clerk.
(N 628)

BOROUGH OF SLOUGH

IMPROVED LIGHTING SCHEME—TRUNK ROAD A.4

TENDERS are invited for the supply and erection of 74 Group "A" Street Lighting Columns together with the supply and installation of 400 W Mercury Vapour lighting equipment incorporating aero-screened lanterns, at London Rd, Slough.

Forms of Tender, Specification and Bills of Quantities may be obtained on application to the Borough Engineer, Town Hall, Slough, on payment of a deposit of two guineas, which will be returned on receipt of a bona fide tender.

General Conditions of Contract and Drawings may be inspected at the Office of the Borough Engineer.

Tenders in plain sealed envelopes endorsed "Trunk Road Lighting" addressed to the undersigned, must be received not later than noon on Monday, 6 Dec., 1954.

The Council do not bind themselves to accept the lowest or any tender.

NORMAN T. BERRY,
Town Clerk.

Town Hall, Slough.
2 Nov., 1954. (N 653)

COUNTY BOROUGH OF BARNSLEY

GROUP "A" STREET LIGHTING IMPROVEMENT SCHEMES

TENDERS are invited for the supply and delivery of Street Lighting Standards and Equipment in connection with the above schemes.

Forms of Tender and Specifications may be obtained from the Borough Engineer, Town Hall, Barnsley, and completed tenders should be returned in the envelopes provided to reach the undersigned not later than Monday, 29 Nov., 1954.

The Corporation do not bind themselves to accept the lowest or any tender and reserve the right to accept a tender for all or any of the items contained in the Specification.

A. E. GILFILLAN,
Town Clerk.

Town Hall,
Barnsley.
Nov. 1954. (N 677)

APPOINTMENTS VACANT

Engagement of persons must be made through a Local Labour Office or Scheduled Employment Agency, if the applicant is a man aged 18–64, or a woman aged 18–59; unless the person concerned is excepted or the employment is in a managerial or professional capacity, or is otherwise excepted from the provisions of the Notification of Vacancies Order, 1952.

ELECTRICITY AUTHORITY OF CYPRUS

RESIDENT ENGINEER
(TRANSMISSION LINE CONSTRUCTION)

APPLICATIONS are invited for the appointment of a Resident Engineer to supervise the construction, by Contractors, of extensions to the Authority's 66 kV and 11 kV transmission network. Applicants must be fully experienced in the construction of transmission lines up to and including 66 kV and the handling of contracts. Experience and/or knowledge of maintenance of similar lines would be an advantage and preference would be given to Corporate Members of the Institutions of Civil and/or Electrical Engineers or those holding qualifications exempting them from Institution examinations.

The appointment will be on a scale of £1,500/£50/£1,800 per annum, the point of entry into the scale depending on qualifications and experience.

Free quarters with heavy furniture, or an allowance in lieu, will be provided by the Authority.

The appointment will be for a period of two years terminable by three months' notice on either side. On the completion of the construction work consideration may be given by the Authority to permanent employment in Cyprus.

Free first-class passages would be provided for the officer and his family up to three full passages, on first appointment and on termination of the agreement.

Leave on full pay is earned at the rate of 2½ days per month of residence in Cyprus, and may be taken in the United Kingdom on termination of the agreement.

Applications, endorsed Resident Engineer (Transmission Line Construction) Cyprus, stating age, qualifications and experience, should be forwarded within 14 days of the date of this advertisement to the undersigned, who will communicate with candidates selected for further consideration.

Preece, Cardew and Rider,
8, 10 and 12 Queen Anne's Gate,
Westminster, S.W.1. (N 631)

THE SOUTH WEST SCOTLAND ELECTRICITY BOARD

Lanarkshire Sub-Area

APPOINTMENT OF 3RD ASSISTANT ENGINEER
(SUB-AREA PLANNING AND DEVELOPMENT)

APPLICATIONS are invited for the appointment of 3rd Assistant Engineer in the Sub-Area Planning and Development Department.

Candidates should be Graduates of the Institution of Electrical Engineers or hold equivalent qualifications. They should have had a sound engineering training with subsequent experience in the planning and layout of 11 kV and lower voltage networks. They should also be conversant with "Load Flow" Diagrams and Voltage Drop Calculations.

The Salary and Conditions of Service will be in accordance with the National Joint Board Agreement, Schedule "A," the present Classification and Grading being K.10, Salary £719/£750 per annum, which will be subject to the statutory deductions including superannuation. The successful candidate will require to reside within a reasonable distance of the Sub-Area Offices in Hamilton.

Application Forms, which may be obtained from the undersigned, should be forwarded to this office within 14 days of the date of this advertisement.

DUGALD SMITH,
Manager.

137 Almada St,
Hamilton. (N 621)

BRITISH ELECTRICITY AUTHORITY
East Midlands Division

APPLICATIONS are invited for the following positions within the Division:

SHIFT CONTROL ENGINEER
NORTHAMPTON POWER STATION
Vacancy No. 170/54/ET

Applicants should have a sound technical education and experience in the operation of turbo-generators and control room duties.

Salary will be in accordance with National Joint Board Agreement, Class G, Grade 10 (£608/£630 per annum).

Closing date for receipt of applications, 22 Nov., 1954.

GENERAL ASSISTANT ENGINEER
NOTTINGHAM TRANSMISSION SECTION
Vacancy No. 171/54/ET

Applicants should have experience of the maintenance and operation of high voltage overhead lines, transformer and switchgear up to 132 kV and should preferably be Graduates of the Institution of Electrical Engineers.

Salary in accordance with Class AX/DX, Grade 8 (£501/£694 per annum) of the National Joint Board Agreement.

Closing date for receipt of applications, 22 Nov., 1954.

SECOND ASSISTANT ENGINEER
(ELECTRICAL) GENERATION
(CONSTRUCTION)
Vacancy No. 173/54/ET

Preference will be given to applicants who hold a degree in Electrical Engineering, are Corporate Members of the Institution of Electrical Engineers or possess other equivalent qualifications.

They should have had experience in the design and installation of switchgear, transformers and cables up to 33 kV and other electrical equipment associated with modern power stations.

Experience in the preparation of specifications and estimates and preparing reports on tenders will be a recommendation.

Salary will be within Schedule C, Class AX/DX, Grade 2 (£834/£1,053 per annum) of the National Joint Board Agreement.

Closing date for receipt of applications, 22 Nov., 1954.

These appointments will be pensionable within the terms and provisions of the British Electricity Authority and Area Boards Superannuation Scheme.

Applications should be submitted on the official form A.E.6/ACT, which may be obtained from the Divisional Establishments Officer, British Electricity Authority, P.O. Box 25, Barker Gate, Nottingham, and should be returned to the undersigned by the date stated. Please quote Vacancy Number.

L. F. JEFFREY,
Divisional Controller.

5 Nov., 1954. (N 671)

THE EAST MIDLANDS ELECTRICITY BOARD

GENERAL ASSISTANT ENGINEER
GRANTHAM DISTRICT

APPLICATIONS are invited for the position of General Assistant Engineer in the Mains Department of the Grantham District.

Candidates should have experience of both underground and overhead networks with voltages up to and including 11 kV and be capable of carrying through distribution schemes from the initial planning stage to final commissioning.

The possession of the Higher National Certificate in Engineering or an equivalent qualification, would be an advantage.

Ability to drive a motor vehicle is essential and the successful applicant will be required to undertake standby duties and to reside in, or near to the Borough of Grantham, in which connection a house occupied by an Assistant Engineer will shortly become available.

The salary and conditions of service will be in accordance with the National Joint Board Agreement Class "D," Grade 9/1, namely £561 per annum.

Applications giving details of age, education, qualifications, experience and position held, should be forwarded to the Sub-Area Manager, Lincolnshire Sub-Area, North House, Grantham, and be received within 14 days of this advertisement. (N 640)

GOVERNMENT OF NIGERIA

ASSISTANT ELECTRICAL ENGINEER
RAILWAY DEPARTMENT

To be responsible to the Electrical Engineer for all electrical branches of the Department, viz. Transformer Sub-Station, maintenance and repairs of all electrical equipment in Workshops, House wiring and maintenance, Train Lighting, Wharf Plant, small power stations at outside Depots, and station and yard lighting where provided.

Appointment is either pensionable on probation in the salary range £910/£1,560 per annum gross, or on contract in the range £1,116/£1,898 per annum gross plus a gratuity of £150 per annum payable on satisfactory completion of contract. Free 1st Class passages for the officer, his wife, and an annual maintenance allowance of up to £75 each is payable in respect of a maximum of two children. Furnished quarters provided if available at low rental. Leave is granted at the rate of 7 days per completed month of resident service.

Candidates, between 30 and 35, should be Associate Members of the Institution of Electrical Engineers, or have passed or be exempt from Parts A and B of the Institution's examination, and have served an apprenticeship with a reputable Electrical Engineering firm. They should have had experience in Workshops and Drawing Office with particular emphasis on installation of H.T. and L.T. Power equipment and distribution systems, and have had some administrative experience.

Apply in writing to the Director of Recruitment, Colonial Office, Great Smith St, London, S.W.1, giving briefly age, qualifications and experience. Mention the reference number BCD.110/14/030. (N 635)

CITY OF PORT ELIZABETH
Electricity Department

VACANCY FOR METER MECHANICIAN AND TESTER

APPLICATIONS are invited for the permanent position of Meter Mechanician and Tester at a rate of pay of 3s. 11d. per hour, plus Cost of Living Allowance, which is, at present 68s. per week for single employees, and 101s. 6d. per week for married employees. In addition, merit pay will be payable in terms of the Conditions of Service.

Applicants must be fully experienced and be capable of testing and calibrating polyphase kWh, kVA and MDI meters, standardisation of instruments and transformers, and be thoroughly familiar with the general routine in the Meter Department of a modern electricity supply undertaking.

Further details regarding leave, merit pay, pension fund, etc., can be obtained from Davis and Soper Ltd., 52 and 54 St. Mary Axe, London, E.C.3.

G. H. BREWER,
Town Clerk.

1 Nov., 1954. (N 650)

UGANDA ELECTRICITY BOARD

APPLICATIONS are invited for the following appointment on the permanent staff: CABLE JOINTER with experience in the laying and jointing of underground cables of all types on system voltages up to and including 11 kV. Single man preferred. Starting salary according to experience in the scale of £783 per annum rising to £1,053 per annum, including a variable cost-of-living allowance which is at present 35%.

Free, partly-furnished accommodation is provided. Free medical and dental treatment. Three-year contract in the first instance with free passages to and from Uganda up to a maximum of three adult fares. Vacation leave on full pay.

Uganda has a pleasant and healthy climate, while taxation is not high.

Application forms and further information may be obtained from the Board's London Office at 27 Regent St, London, S.W.1. Applications to reach London Office by 27 Nov., 1954.

C. R. WESTLAKE,
Chairman.
(N 643)

BRITISH ELECTRICITY AUTHORITY
Southern Division

APPLICATIONS are invited for the following position:

STATION SUPERINTENDENT, PORTSMOUTH GENERATING STATION
MA/PFC/4

Applicants should have received a thorough technical and practical training followed by wide experience in the operation and maintenance of generating station plant and have also held a position of responsibility involving the control of technical and administrative staffs. Preference will be given to corporate members of one of the senior professional engineering institutions, or those holding similar qualifications.

Salary N.J.M., Grade 1, £1,150/£1,300.

Special application forms obtainable from P. D. A. Oliver, Divisional Secretary, High St, Portsmouth, should be returned by 24 Nov., 1954. Please quote ref. E.T. 5 Nov., 1954. (N 668)

EASTERN ELECTRICITY BOARD
Fens Sub-Area Headquarters

2ND ASSISTANT ENGINEER (PLANNING AND DEVELOPMENT)
162/54.R

CANDIDATES should have had a wide experience in the design, layout and operation of urban and rural distribution systems comprising overhead and underground networks (including substations) at voltages up to and including 33 kV. They should be experienced in the preparation of distribution schemes including the technical design, specification and estimates. Corporate membership of the Institution of Electrical Engineers or the possession of a degree in electrical engineering will be an advantage.

Salary will be in accordance with Class H, Grade 6, of the National Joint Board Salary Agreement commencing at £833 and future salary and conditions of service will be in accordance with agreements made from time to time by the appropriate negotiating bodies.

The successful candidate will be required to contribute to a superannuation scheme and may be required to undergo a medical examination.

Applications by letter stating age, education, qualifications and experience with details of present appointment and salary, should be submitted to the Manager, Fens Sub-Area, Eastern Electricity Board, Milton Hall, Milton, Cambridge, within fourteen days of the appearance of this advertisement.

Previously advertised in Sep. 1954 under reference No. 140/54.R. Applications submitted on that occasion will be automatically reconsidered. (N 669)

BRITISH ELECTRICITY AUTHORITY
Southern Division

APPLICATIONS are invited for the following position:

JUNIOR ENGINEERS
S/13.583

Applicants should have served an apprenticeship or had practical training suitable to the Industry. They should possess a sound general and technical education and preference will be given to those possessing a Higher National Certificate (or those nearing completion of H.N.C. courses). Opportunities are available for junior engineers to complete their studies and gain wide experience with good prospects of promotion.

The duties of those appointed will vary, but will include as a general rule, the operation and control, under supervision, of generating plant.

Vacancies also exist for those who wish to specialise in maintenance of electrical and mechanical generating plant, transmission lines, substations and cables, or generating station construction work.

Commencing salary within range £402/£556 (N.J.B.), depending on qualifications, experience and position to which appointed.

Special application forms obtainable from P. D. A. Oliver, Divisional Secretary, 111 High St, Portsmouth, should be returned by 24 Nov., 1954. Please quote ref. E.T. (N 666)

YORKSHIRE ELECTRICITY BOARD
Head Office

EDUCATION AND TRAINING OFFICER

APPLICATIONS are invited for the post of Education and Training Officer, in the Secretary's Department, at the Head Office of the Board.

Candidates should have wide experience in the field of education and training in Industry, and should be capable of preparing schemes of training for all grades of employees. Experience in the Electricity Supply Industry is desirable, but not essential.

Salary—N.J.C. Grade 9, £1,000/£40/£1,120 per annum.

THIRD ASSISTANT ENGINEERS (SYSTEM CONTROL)—(SHIFT)

Engineers are required for training as Distribution System Control Engineers. Applicants should have had reasonable practical experience in the operation of large distribution systems operating at voltages up to 33 kV and should be Corporate Members of the Institution of Electrical Engineers, or possess equivalent qualifications.

Candidates who, after training, are found suitable will be appointed as System Control Engineers (Grade 4, AX/EX, £763/£1,003) to staff new Control Centres which are to be set up in the area.

Salary—N.J.B. Grade AX/EX5 commencing within the range £649/£790 per annum rising to £883 per annum.

Applications, giving full details of age, qualifications and experience, together with the names of two referees, should be forwarded to the Secretary, Yorkshire Electricity Board, Wetherby Rd, Scarcroft, Leeds, not later than 25 Nov.; 1954.

No. 5 (Wakefield) Sub-Area

Castleford District

FIRST ASSISTANT DISTRICT ENGINEER

Applicants must have had a sound practical training and considerable experience in all branches of electricity distribution work covering Industrial, Urban and Rural areas with underground and overhead systems. Corporate Membership of the Institution of Electrical Engineers or equivalent qualification is essential.

Applicants must hold a current driving licence and be prepared to reside in the district.

Salary—N.J.B. Class F, Grade 5, £791/£818 per annum.

Applications, giving full details of age, qualifications and experience, together with the names of two referees, should be forwarded to the Manager, No. 5 (Wakefield) Sub-Area, Yorkshire Electricity Board, 1a Denby Dale Rd, Wakefield, not later than 25 Nov., 1954.

No. 3 (Sheffield) Sub-Area

Sheffield North District

THIRD ASSISTANT DISTRICT ENGINEER

Applicants should preferably have technical qualifications equivalent to Corporate Membership of the Institution of Electrical Engineers, and must have had experience in construction, operation and maintenance of 11 kV and L.V. overhead and underground distribution systems including substation equipment.

The successful candidate will be expected to organise and control maintenance, supervise construction work, and carry out operational duties on 11 kV and L.V. overhead and underground mains and substations in a district containing a heavy industrial and densely developed residential area surrounded by a rural area.

Salary—N.J.B. Class K, Grade 9, £766/£796 per annum.

Applications, giving full details of age, qualifications and experience, together with the names of two referees, should be forwarded to the Manager, No. 3 (Sheffield) Sub-Area, Yorkshire Electricity Board, Commercial St, Sheffield, not later than 25 Nov., 1954.

No. 1 (Bradford) Sub-Area

THIRD ASSISTANT ENGINEER (METERS, TESTING AND PROTECTION)

Candidates should hold at least Graduate Membership of the Institution of Electrical Engineers or equivalent technical qualifica-

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tions. They should have good experience in the commissioning of new equipment in large substations and in routine testing and maintenance of protective gear. Ability to calculate fault levels, grade protection and undertake cable and fault location, and experience in these matters is desirable. The post may involve a measure of standby availability.

Salary—N.J.B. Class K, Grade 10, £719/£750 per annum.

Applications, giving full details of age, qualifications and experience, together with the names of two referees, should be forwarded to the Manager, No. 1 (Bradford) Sub-Area, Yorkshire Electricity Board, 45-53 Sunbridge Rd, Bradford, not later than 25 Nov., 1954.

No. 7 (Grimsby) Sub-Area

Gainsborough District

INSTALLATION ENGINEER

The person appointed will be responsible for the organisation and administration of the contracting section including the supervision of manual workers. He must be capable of preparing specifications and estimates and supervising schemes for complete installations of all types and must have a thorough knowledge of the Electricity Supply Regulations and the I.E.E. Regulations for the Electrical Equipment of Buildings. Preference will be given to Corporate Members of the Institution of Electrical Engineers.

Salary—N.J.B. Class D, Grade 8, £592/£610 per annum.

Applications, giving full details of age, qualifications and experience, together with the names of two referees, should be forwarded to the Manager, No. 7 (Grimsby) Sub-Area, Yorkshire Electricity Board, Moss Rd, Grimsby, not later than 25 Nov., 1954.

No. 5 (Wakefield) Sub-Area

Wakefield, Castleford and Barnsley Districts

GENERAL ASSISTANT DISTRICT ENGINEERS

Applicants must have had a sound practical training with experience in the construction, operation and maintenance of H.V. and M.V. overhead and underground distribution networks, substation plant and ancillary equipment.

Applicants must hold a current driving licence, be prepared to reside in the district to which they are appointed, and undertake standby duties.

Applicants must hold at least the Higher National Certificate in Electrical Engineering.

Salary—N.J.B. Class F, Grade 11, £548/£565 per annum.

Applications, giving full details of age, qualifications and experience, together with the names of two referees, should be forwarded to the Manager, No. 5 (Wakefield) Sub-Area, Yorkshire Electricity Board, 1a Denby Dale Rd, Wakefield, not later than 25 Nov., 1954.

No. 6 (Hull) Sub-Area

Bridlington District

GENERAL ASSISTANT DISTRICT ENGINEER (DRIFFIELD)

Applicants should hold the Higher National Certificate in Electrical Engineering or equivalent qualifications, and have had experience in the construction, operation and maintenance of E.H.T. and L.T. overhead and underground distribution systems in a mixed urban and rural district.

The successful applicant will be required to reside in Driffield, and may be required to undertake standby duty.

Salary—N.J.B. Class D, Grade 11, £500/£516 per annum.

Applications, giving full details of age, qualifications and experience, together with the names of two referees, should be forwarded to the Manager, No. 6 (Hull) Sub-Area, Yorkshire Electricity Board, Ferensway, Kingston-upon-Hull, not later than 25 Nov., 1954.

No. 4 (Leeds) Sub-Area

ENGINEERING DRAUGHTSMAN (ELECTRICAL)

Applicants should be competent draughtsmen with good general and technical education and should preferably have had experi-

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continued from previous column

ence in the preparation of substation layout and electrical diagrams.

Salary—N.J.B. Schedule D, Grade 6, £433/£567 per annum.

Applications, giving full details of age, qualifications and experience, together with the names of two referees, should be forwarded to the Manager, No. 4 (Leeds) Sub-Area, Yorkshire Electricity Board, Bramhope, near Leeds, not later than 25 Nov., 1954. (N 658)

BRITISH ELECTRICITY AUTHORITY
South East Scotland Division

have vacancies for the following:

ASSISTANT SECTION ENGINEER for Edinburgh (Currie) Section. Applicants should have at least two years' experience in maintenance of 132 kV Transmission Lines, cables and substation equipment, and possess qualifications leading to Corporate Membership of the Institution of Electrical Engineers. Salary £584/£745 (N.J.B. Class AX/BX/6). Pension Scheme. No car allowance. Transport provided.

GENERAL ASSISTANT ENGINEER (TRANSMISSION) required for the Transmission Department at Portobello. Applicants should possess Higher National Certificate in Electrical Engineering, or equivalent qualification, and preferably have had some works training or experience in Construction of HV Substations. Salary scale £501/£656 (N.J.B. Class AX/BX/8). Placing according to experience. Pension Scheme.

Apply in writing by 20 Nov., 1954, to Divisional Controller, British Electricity Authority, South East Scotland Division, British Electricity Hse, High St, Portobello, Midlothian. (N 649)

LONDON ELECTRICITY AUTHORITY
London Division

APPLICATIONS are invited for the following superannuable post. Conditions of service in accordance with N.J.B. Agreement, Schedule A. Salary includes London Allowance. Qualifications entitling to Graduate Membership of the I.E.E. or I.MECH.E. an advantage.

SHIFT CHARGE ENGINEER—TAYLORS LANE GENERATING STATION

Vacancy No. 54/934

Sound Electrical and Mechanical training necessary with experience in efficient operation of a generating station. Character and ability to deal with staff problems is important. Salary—Class F, Grade 7=£731. 17s. per annum.

Applications, quoting vacancy number, may be made on form obtainable from Divisional Secretary, British Electricity Authority, London Division, P.O. Box 136, Generation House, Great Portland St, W.1, and be received within 14 days of this advertisement. (N 656)

SOUTH EASTERN ELECTRICITY BOARD

THIRD ASSISTANT DISTRICT ENGINEER—LEWES DISTRICT

SALARY £561/£578 p.a. under N.J.B. Class D, Grade 9. Superannuable. Applicants should be suitably qualified and have had training and experience in the construction, operation and maintenance of underground and overhead distribution systems up to and including 33 kV. Experience of DC/AC changeover an advantage.

Applications, naming 2 referees to G. R. Lincoln, A.I.E.E., SEEBoard, 80/81 High St, Lewes, Sussex, by 24 Nov., 1954.

METER TESTER ASSISTANTS—CROYDON AND W. KENT SUB-AREA METER DEPARTMENT

Wages 3s. 8½d. per hour for a 44-hour, 5-day week, under N.J.I.C. Agreement. A knowledge of meter or instrument work an advantage, but applications will be considered from persons willing to be trained in meter repair and testing work.

Applications naming 2 referees to T. A. D. Honnor, M.I.E.E., Croydon and W. Kent Manager, SEEBoard, Electric Hse, Wellesley Rd, Croydon, by 24 Nov., 1954.

A. L. BURNELL,
Secretary.
(N 664)

PROFESSIONAL ENGINEERS IN VARIOUS GOVERNMENT DEPARTMENTS

THE Civil Service Commissioners invite applications for pensionable posts in a wide variety of mechanical and electrical engineering duties.

Candidates must be under 35 on 1 Jan., 1954, with extension for regular service in H.M. Forces and up to two years for permanent civil service. For the Post Office they must be at least 21, for the Ministry of Supply and Ministry of Transport and Civil Aviation at least 23, and for all other Departments at least 25 on that date.

Generally a candidate must possess a University degree in Engineering or be a Corporate Member of one of the professional institutions—Mechanical Engineers, Electrical Engineers, or Civil Engineers or have passes in, or exemption from, Sections A or I and B or II of the corresponding Associate Membership examinations. Exceptionally candidates of high professional attainment, but without the specified qualifications, may be admitted. For some posts Associate Fellowship of the Royal Aeronautical Society or an Honours degree in Physics or Engineering will be accepted.

London salary scale (Men) £650 (at age 25) to £1,000. Starting salary according to age up to £900 at 34. Candidates entering below age 25 will start at salaries varying from £450 at age 21 to £570 at age 24. Prospects of promotion. Salaries of next higher grades are £1,000/£1,320 and £1,375/£1,575. Somewhat lower for women and in the provinces.

Further particulars and application forms from Civil Service Commission, Scientific Branch, 30 Old Burlington St, London, W.1, quoting No. S85/54. Completed applications should be returned as soon as possible and in any case before 31 Dec., 1954. (N 654)

BRITISH ELECTRICITY AUTHORITY
Midlands Division

APPLICATIONS are invited for the following positions in the Generation (Operation) Department at Hams Hall "A" Power Station, near Birmingham. N.J.B. service conditions, superannuable appointments, salaries within Schedule "A" of the Agreement:

(*a*) ASSISTANT MAINTENANCE ENGINEER (Electrical), Grade J8, commencing at £764 per annum. (Vacancy No. 809.MD).

(*b*) BOILER HOUSE SHIFT CHARGE ENGINEER, Grade J9, commencing at £719 per annum. (Vacancy No. 810.MD).

Applicants for these positions should have received a sound technical training and practical experience, in particular for (*a*) in power station electrical maintenance, and for (*b*) in the control and operation of steam generating plant, including pulverised fuel-fired boilers, and main switchgear. Appropriate technical qualifications an advantage.

Apply, quoting the vacancy number, on form AE.6, available from the Establishments Officer, 53 Wake Green Rd, Moseley, Birmingham 13, by 27 Nov., 1954. (N 672)

NORTH OF SCOTLAND HYDRO-ELECTRIC BOARD
Aberdeen Area

STAFF VACANCY—SECOND ASSISTANT ENGINEER (MAINS)

THERE is a vacancy in the Aberdeen Area for a Second Assistant Engineer with N.J.B. grading of F/7 (£697/£718).

Written applications should be addressed to the undersigned before 24 inst.

The duties of the successful applicant will be the maintenance of electrical equipment in 33 kV, 11 kV and 6·6 kV substations throughout the Area, and eventually taking part in a rota of standby duty in the Aberdeen City (No. 2 District) in accordance with N.J.B. arrangements. Applicants must have had a recognised apprenticeship and be technically qualified, in addition to the necessary experience.

J. E. WHITTAKER,
Area Manager.

Area Offices,
Millburn St,
Aberdeen. (N 665)

NORTH OF SCOTLAND HYDRO-ELECTRIC BOARD
Northern Area

APPLICATIONS are invited for post of ASSISTANT DISTRICT ENGINEER in the Ross-shire and Sutherland Area. Applicants should preferably be Corporate Members of the Institution of Electrical Engineers or hold equivalent qualifications and should have had training in operation and maintenance of HV and LV overhead lines in a rural distribution area.

Salary £587/£649 (N.J.B. Grades E.9/7) depending on qualifications and experience. Superannuation Scheme applicable. Application form obtainable from the undersigned to be returned within 14 days of the publication of this advertisement.

R. B. ANDERSON,
Area Manager.

North of Scotland Hydro-Electric Board.
Church St,
Dingwall. (N 642)

METROPOLITAN WATER BOARD

APPOINTMENT OF ASSISTANT ENGINEERS (ELECTRICAL)

THERE are vacancies for Assistant Engineers (Electrical) on the permanent pensionable staff. Salary scale £760/£30/£940 per annum. Commencing salary according to age and experience. Maximum age 45 years. It is a condition of the appointment to and the holding of the positions that the selected candidates shall be and continue to be subscribing corporate members of the Institution of Electrical Engineers. Housing accommodation may be available, if required, in a good neighbourhood, at an inclusive rent of £130 per annum. A form of application may be obtained from the undersigned on receipt of a stamped addressed foolscap envelope, quoting reference (G.P.5) and completed applications must arrive not later than 6 Dec., 1954.

W. S. CHEVALIER,
Clerk of the Board.

Offices of the Board,
New River Head,
Rosebery Ave,
London, E.C.1. (N 565)

MIDLANDS ELECTRICITY BOARD

APPLICATIONS are invited for the following superannuable posts:

SECOND ASSISTANT ENGINEER (COMMERCIAL), WORCESTER & DISTRICT SUB-AREA HEADQUARTERS

Applicants should have experience in the Industrial and Commercial applications of electricity and installation work. Experience in Air Ministry and other Government Contracting Work preferable. Technical qualifications desirable. Salary £883/£918 per annum (N.J.B. Grade J.6). Applications in writing, within 14 days stating age, qualifications, present position and salary to Mr R. Mallet, Sub-Area Manager, Midlands Electricity Board, Whittington, Worcester.

GENERAL ASSISTANT DISTRICT ENGINEER, SHREWSBURY DISTRICT, SHROPSHIRE & HEREFORDSHIRE SUB-AREA

Experience necessary in all branches of distribution work including operation and maintenance of high and low voltage, underground and overhead distribution systems. Technical qualifications desirable. Salary £555/£569 per annum (N.J.B. Grade E.10). Applications in writing, within 14 days stating age, experience, present salary and position to Mr W. Winwood, Sub-Area Manager, Midlands Electricity Board, Spring Gardens, Ditherington, Shrewsbury.

THIRD ASSISTANT DISTRICT COMMERCIAL ENGINEER, GLOUCESTER DISTRICT, CENTRAL GLOUCESTERSHIRE SUB-AREA

Duties primarily development of Radio and T/V sales and service. Experience essential. Technical qualifications desirable. Salary £555/£569 per annum (N.J.B. Grade E.10). Applications in writing, within 14 days stating age, experience, present salary and position to Mr D. Holt, Sub-Area Manager, Midlands Electricity Board, 126 London Rd, Gloucester.

A. STEPHENS,
Secretary. (N 670)

THE NORTH EASTERN ELECTRICITY BOARD

APPLICATIONS are invited for the following appointments in the Chief Engineer's Department, Operation and Maintenance Section:

GENERAL ASSISTANT ENGINEER, System Protection Sub-Section, with location at Sunderland. Applicants must possess Higher National Certificate in electrical engineering or its equivalent. Salary—Schedule "C," Grade 8—£501/£694. N.J.B. conditions of service.

ARCHITECTURAL DRAUGHTSMAN, with location at Carliol House, Newcastle upon Tyne. Applicants should have had a sound technical education and practical experience in the lay-out and design of buildings, reinforced concrete structures, piled and slab foundations for components and the preparation of detailed drawings. Salary—Schedule "D," Grade 4—£671/£780. N.J.B. conditions of service.

Applications stating age, qualifications and experience, should be forwarded to the Secretary (Establishments), The North Eastern Electricity Board, P.O. Box No. 117, Carliol House, Newcastle upon Tyne, within ten days of the appearance of this advertisement. (N 657)

BRITISH ELECTRICITY AUTHORITY
Yorkshire Division

require a DEPUTY STATION SUPERINTENDENT at Skelton Grange Power Station, Leeds.

This station will have an ultimate capacity of 360 MW.

Salary £1,104/£1,156 per annum, Class J, Grade 3, N.J.B. Agreement (Schedule A).

Applicants should have had experience in the operation and maintenance of large modern power station plant, including pulverised fuel fired boilers, have held a position of responsibility involving the control of staff, and should be Corporate Members of the Institution of Electrical and/or Mechanical Engineers.

Application Forms obtainable from Divisional Secretary (Establishments), British Electricity House, St. Mary's Rd, Leeds 7, to be returned within 14 days of the appearance of this advertisement.

G. A. VOWLES,
Divisional Controller.
(N 667)

CARDIGANSHIRE EDUCATION COMMITTEE
Cardigan Grammar School

WANTED to commence duties, if possible, in January a MASTER to share duties between Grammar School and Day Release Classes (mainly R.A.E.) in the teaching of Engineering Science.

Graduates with special interest in Applied Physics or Electrical Engineering welcomed and applications from holders of Higher National Certificate with special interest in Telecommunications will be especially welcomed. At present, classes are limited to S1 and S2, but extensions and addition of a new Telecommunications Laboratory and a Drawing office are planned for next year.

Possibility of a Council House in School Area. Burnham scale with full allowances for experience (industrial and teaching) and qualifications.

Apply immediately (no Forms) to the Headmaster, Grammar School, Cardigan.

Canvassing will disqualify.

J. HENRY JONES,
Director of Education.

Swyddfa'r Sir,
Aberystwyth. (N 688)

BRITISH ELECTRICITY AUTHORITY
North West, Merseyside & N. Wales Division

VACANCY NO. 213/54/T — FIRST ASSISTANT STATION CHEMIST, Kearsley Generating Station, Stoneclough, near Manchester. Salary £766/£796 (K.9). Closing date: 1 Dec.

Vacancy No. 220/54/T — MAINTENANCE ENGINEER (Electrical), Chadderton "B" Generating Station, near Manchester. Salary £787/£818 (G.6). Closing date: 20 Nov.

Applications, quoting Vacancy No., to Controller, British Electricity Hse, 825 Wilmslow Rd, Manchester 20. (N 675)

RITISH ELECTRICITY AUTHORITY
South Western Division

GENERAL ASSISTANT ENGINEER required in the Technical Department (Plymouth Region).

Superannuation Scheme. Salary, N.J.B. Class "AX/CX," Grade 8, £501/£675.

Applicants should possess qualifications leading to A.M.I.E.E. and have served with one of the leading electrical manufacturers. They should have an interest in protective gear design and generator and switchgear testing.

Applications on Form A.E.6/ACT, obtainable from the Divisional Secretary, 26 Oakfield Rd, Bristol 8, should be completed and returned by 22 Nov., 1954.

Previous applicants need not re-apply. (N 655)

ELECTRICIAN WIREMAN

required by the FALKLAND ISLANDS GOVERNMENT for one tour of three years in the first instance. Rate of pay 3s. 7d. an hour plus cost of living bonus at present 8d. and hour. 45-hour week with ample opportunity for overtime at increased rates. Free return passages. Leave on full pay. Candidates, unmarried, must be capable of wiring domestic and small factory installations and undertaking L.T. overhead lines erection and maintenance. Write to the Crown Agents, 4 Millbank, London, S.W.1. State age, name in block letters, full qualifications and experience and quote M2A/40512/EE. (N 636)

MERSEYSIDE AND NORTH WALES ELECTRICITY BOARD

ASSISTANT SECTION ENGINEER required in the Oswestry District. Salary £587/£600 per annum (N.J.B. E/9). Appointment superannuable and subject to medical examination.

Applicants should preferably have the technical qualifications to enable them to become Chartered Electrical Engineers, and have had experience of H.V. and M.V. overhead and underground distribution work.

Application forms, obtainable from the Manager, No. 4 Sub-Area, Electricity Hse, Rhostyllen, near Wrexham, should be completed and returned to him not later than 22 Nov., 1954. (N 630)

DEPUTY PRINCIPAL

required by the GOVERNMENT TECHNICAL INSTITUTE, BRITISH GUIANA, for appointment on contract for three years in the first instance. Salary equivalent to £1,050 a year (including present temporary allowance of £50 a year). Gratuity at the rate of £225 a year. Free passages. Liberal leave on full salary. Candidates must hold a C. and G. Full Technological Certificate or H.N.C. in Electrical or Mechanical engineering or a similar qualification and have had a wide industrial and teaching experience. They must be able to undertake lectures at all levels up to the standard of the H.N.C. and the examinations for the Professional Institutions. Write to the Crown Agents, 4 Millbank, London, S.W.1. State age, name in block letters, full qualifications and experience and quote M2A/30288/EE. (N 637)

BRITISH ELECTRICITY AUTHORITY
Midlands Division

SECTION LEADER (MECHANICAL DRAUGHTSMAN) is required in the Generation (Construction) Department at Divisional Headquarters, Birmingham. N.J.B. service conditions, superannuable appointment, salary within Schedule "D," Grade 3, of the Agreement, £780/£884 per annum.

Applicants should preferably have experience in the design and layout of power station plant, including boilers, turbo-alternators and ancillary equipment; high and low pressure steam and feed pipework; condensing plant and feed heating systems. Appropriate technical qualifications an advantage.

Apply on form A.E.6, quoting vacancy number 811.MD, to the Establishments Officer, 53 Wake Green Rd, Moseley, Birmingham 13, by 27 Nov., 1954. (N 673)

THE EAST MIDLANDS ELECTRICITY BOARD
THIRD ASSISTANT ENGINEER, OPERATION MAINTENANCE AND TESTING—LINCOLNSHIRE SUB-AREA HEADQUARTERS

APPLICATIONS are invited for the position of Third Assistant in the Engineering Department of the Lincolnshire Sub-Area Headquarters.

Candidates should have a good technical training and practical experience in the operation of urban and rural distribution systems up to and including 33 kV, and a general knowledge of maintenance of switchgear, transformers and auxiliary equipment. The duties will include fault location, and experience of this will be an added advantage.

The commencing salary and conditions of service will be in accordance with Class "H," Grade 11/1 (£607/£628).

The ability to drive a motor vehicle is essential and the person appointed will be required to reside in or near Grantham.

Applications, giving details of age, education, experience and qualifications, should be forwarded to the Sub-Area Manager, North Hse, Grantham, and be received within 14 days of this advertisement. (N 641)

RADIO MECHANIC

required for the BERMUDA POLICE FORCE in the rank of Constable for a tour of 5½ years with possibility of permanency. Salary scale (including present temporary allowance of 10% of salary) £715 rising to £825 a year. Free passages and uniform. No income tax. Candidates must be unmarried, between 21 and 28 years of age, of sound physique and good education. They must be familiar with Signal Generator, Valve Tester, Anometer and Battery Charger Equipment and also VHF Equipment similar to Pye Series PTC 704 (Fixed Unit) and Pye Series PTC 115 (Mobile Units). Write to the Crown Agents, 4 Millbank, London, S.W.1. State age, name in block letters, full qualifications and experience and quote M1/36551/EE. (N 622)

BRITISH ELECTRICITY AUTHORITY
Midlands Division

STATION SHIFT CONTROL ENGINEERS (5) are required at Meaford "B" Power Station, near Stone, Staffordshire. N.J.B. service conditions, superannuable appointments, salaries within Schedule "A" of the Agreement, commencing on Grade G.10, £608 per annum. The Station ultimate classification is "J."

A sound technical training and practical experience in the control and operation of a modern power station are required. Appropriate technical qualifications an advantage.

Apply quoting Vacancy No. 808 MD on form A.E.6, available from the Establishments Officer, 53 Wake Green Rd, Moseley, Birmingham 13, by 27 Nov., 1954. (N 674)

SOUTH WESTERN ELECTRICITY BOARD
DEMONSTRATOR—BARNSTAPLE DISTRICT

SALARY N.J.C., Grade 1, £400/£490 per annum.

Duties include public demonstrations of cooking and electrical appliances, and advice generally on their use. Candidates should possess recognised domestic science qualification, with preferably E.A.W. Electrical Housecraft Certificate.

Application forms obtainable from the Manager, Barnstaple District, Cross St, Barnstaple, should be returned by 27 Nov. 2/D8. 5 Nov., 1954. (N 676)

A LEADING cable manufacturer in North London has a vacancy in the Test and Research Department for a JUNIOR DRAUGHTSMAN. The work involves the design and development of accessories for use with high voltage cables. A knowledge of electrical engineering would be an advantage. Previous experience not essential. Applicant should have completed his National Service. Salary in accordance with A.E.S.D.—Box No. 3969, Electrical Times. (N 561)

Box No. replies to be addressed to the ELECTRICAL TIMES, Sardinia House, Sardinia Street, London, W.C.2.

THE BRITISH THOMSON-HOUSTON COMPANY LIMITED

has vacancies on its design and development staffs at Rugby, Birmingham, Coventry, Leicester, and Newcastle-under-Lyme, for ELECTRICAL and MECHANICAL ENGINEERS with experience in the following fields:

INDUSTRIAL ELECTRONICS (all modern applications of electronics).

ELECTRICAL MACHINE DESIGN (A.C. and D.C., large, intermediate and fractional h.p. sizes).

INDUSTRIAL APPLICATION OF ELECTRICAL EQUIPMENT (steel works, mining, paper mills, machine tools and other industries).

TRANSFORMER DESIGN (large E.H.T., intermediate and small).

AIRCRAFT ELECTRICAL EQUIPMENT (A.C. and D.C. generators, motors, contactors, starters, etc.).

The openings provide good prospects for young men with technical ability and education in a large rapidly growing industry with ample opportunities for gaining experience in new fields. Young men with honours engineering or science degrees or their equivalents, and engineers with practical mechanical design experience on the drawing board, are required. Applications should be made to the Chief Electrical Engineer's department, the British Thomson-Houston Co., Ltd., Rugby, together with particulars of technical qualifications, training and experience. (N 563p)

A SENIOR ASSISTANT ELECTRICAL ENGINEER is required for work on a site in the Home Counties, to take up duty not later than 1 Jan., 1955. Not less than 35 years of age and holding technical qualifications not less than Higher National Certificate. Must have had wide experience on large power plant construction.

TWO ASSISTANT ELECTRICAL CONTRACT ENGINEERS required. Aged 25-30 years and holding B.SC. or other recognised electrical degree. Must have had at least two years' practical experience since qualifying, preferably on large power plant construction.

Apply Personnel Officer, Ewbank and Partners Ltd., 10/11 Grosvenor Place, London, S.W.1. Near Hyde Park Corner. (N 661)

AN OPPORTUNITY OCCURS in progressive manufacturing concern in London area for ENGINEER, aged 25/35, with electrical or physicist degree, on development and research work on high frequency telecommunication cable and associated testing equipment. Salary will be commensurate with qualifications and experience. Apply, giving full particulars to—Box No. 4003, Electrical Times. (N 663)

BRANCH MANAGER required for electrical contracting business in Surrey. Must be able to organise showroom sales and handle contracting. Apply stating age, experience and salary required to—Box No. 3979, Electrical Times. (N 590)

CHIEF DESIGNER

required by a Group of electrical manufacturing companies in the North of England. This is a senior executive appointment and candidates must have originality, organising ability and drive. The successful applicant must be capable of building up a design staff *ab initio* and should preferably have experience in the design of contactors, overload protective devices, etc., and electrical equipment generally. The position is permanent and pensionable and carries a commencing salary of £2,000 per annum with considerable opportunities for the future. Please apply giving details of age, education, training and experience to—Box 2 J., L. 5120, A.K. Advg., 212a Shaftesbury Ave, London, W.C.2. (N 681p)

FERRANTI LTD.
TRANSFORMER DEPARTMENT

have vacancies in their Research and Development Sections for:

(1) SENIOR ENGINEERS with First or Second Class Honours Degrees in Electrical Engineering and with previous experience of research and development work in Power Engineering. The work would be concerned with transformers, voltage regulators, and specialised high voltage equipment. Ref. T.S.E.

(2) JUNIOR ENGINEERS of approximately H.N.C. standard for work in the same fields. Ref. T.J.E.

Permanent staff appointments with pension benefits.

Application forms from:

Mr T. J. Lunt, Staff Manager, Ferranti Ltd., Hollinwood, Lancs.

Please quote appropriate reference. (N 568p)

BRITISH INSULATED CALLENDER'S CABLES LTD., have a vacancy with their Telecommunications Laboratory at Kirkby for an HONOURS GRADUATE in Physics or Electrical Engineering to take charge of a small but growing team engaged on the design of accessories for audio, carrier and V.H.F. cables and the development of pneumatic protection for underground cables. Applications quoting reference P/58/54 should be submitted in writing to: The Staff Officer, B.I.C.C. Ltd., Prescot, Lancs. (N 638)

CONTRACTS ENGINEERS required for handling of Switchgear tenders and contracts. Applications should state age, experience, qualifications and salary required and should be addressed to Personnel Manager, South Wales Switchgear Ltd., Blackwood, Mon. (N 644)

CONTRACT ESTIMATOR required for handling enquiries for the supply and installation of electric cables, for voltages up to 132 kV. Apply giving full details of past experience to the Secretary, W. T. Glover and Co., Ltd., Trafford Park, Manchester, 17. (N 652)

DESIGNER-DRAUGHTSMAN for small accessories, state electrical qualifications and experience, to Wandsworth Electrical Manufacturing Co., Ltd., Sheerwater, Woking, Surrey. (N 614)

DRAUGHTSMAN required (Victoria area) for Manufacture of L.T. Switchgear and General Engineering. Prospects for man with initiative. Write age, experience and salary required.—Box No. 4009, Electrical Times. (N 684)

ELECTRICAL Testing Laboratory requires an experienced ELECTRICIAN to be responsible for the electrical installation and equipment and to assist in the construction of experimental testing machines. Apply, giving details of experience to E.D.A. Testing House, Leatherhead. (N 632)

CHIEF PRODUCTION ENGINEER

A prominent manufacturer desires to appoint a Chief Production Engineer with experience of electric lamp or valve manufacture. The position calls for a person having considerable experience in Lamp making machinery and manufacturing methods.

Prospects are excellent. A first rate salary will be paid to the right man and the position is fully superannuated. Own staff are aware of the vacancy.

Applications in full detail to Box No. 3989, Electrical Times. (N 626p)

ELECTRICAL ENGINEERING GRADUATE, age 28-35, required as assistant in the Geneva Office of the International Electrotechnical Commission. Administrative duties and French-English translation work. Good knowledge French essential. Commencing salary Sw. Frs. 1,500 a month. Pension scheme. Apply—Box No. 3991, Electrical Times. (N 627)

ELECTRICAL ENGINEER SURVEYOR. Due to a typographical error the advertisement of the General Accident Fire and Life Assurance Corporation Ltd., which appeared in the issue of 21 Oct. showed a salary limit other than the scale agreed between the Engineer Surveyors Association and the Insurance Companies. (N 634)

ELECTRIC LAMP MANUFACTURERS (ELMA) require SELLING AGENTS (commission basis only) for all types of electric lamps including Mercury and Sodium. Applicants should be well established with Electricity Boards and other Nationalised Industries, Industrial Users and Wholesalers. Apply with fullest details of experience including Agencies held. Areas available (*a*) East Midlands, (*b*) North Wales and Anglesey, (*c*) South Wales, (*d*) Hants, Sussex and Kent.—Box No. 3999, Electrical Times. (N 648)

ENGINEER, aged 25 to 35, preferably having Higher National Certificate, required for the maintenance of electronic equipment and the testing and alignment of new instruments used for quality control and automatic testing of all types of telecommunication cables. Apply giving full particulars to—Box No. 3951, Electrical Times. (N 502)

ESTIMATORS required by large Electrical Contractors in Scotland. Applicants must have sound practical and technical experience in the contracting field. Superannuation scheme with prospects. Write fully.—Box No. 3995, Electrical Times. (N 639)

JUNIOR ELECTRICAL CABLE ESTIMATOR for Surrey Area. Write with details of experience and salary required to: The Personnel Officer, Hackbridge Cable Co., Ltd., Kelvin Works, Hackbridge, Surrey. (N 645)

KEEN YOUNG SALES ENGINEER required as Lancashire Representative by manufacturers of all forms industrial m.v. switchboards, cubicles, control panels, substation switchboards, feeder pillars, etc., with full range heavy duty combination fused switches to 800 amps and full industrial and domestic range of fusegear. Give details of experience in confidence to—Managing Director, Dennis Switchgear, Fleming Rd, Speke, Liverpool. (N 625)

LIGHTING ENGINEERS required for London Office of Ekco-Ensign Electric Ltd. Applicants must be well educated and conversant with modern practice. Apply Senior Lighting Engineer, 45 Essex St, Strand, W.C.2. (N 618)

MAINTENANCE ELECTRICIANS required for shift work and day work in large Paper Mill. Sound experience of large A.C. and D.C. motors and switchgear essential. Bowater's Thames Paper Mills Limited, Northfleet, Gravesend, Kent. (N 617)

QUALIFIED ENGINEER (British), age 22-25, with degree or equivalent and workshop training, required by company (London district) whose activities will enable experience to be gained in high voltage insulation practice. Submit details to—Box No. 3993, Electrical Times. (N 633)

QUALIFIED ELECTRICAL ENGINEER required for position of Chief Electrical Engineer with company situated in London manufacturing electrical switches and control gear. Age between 30-40 and applicants must hold electrical degree. Write stating age, qualifications, experience and salary required.—Box No. 3981, Electrical Times. (N 591)

ENGLISH ELECTRIC COMPANY LIMITED

at Stafford, have the following vacancies in their Meter and Relay Departments, in a modern air-conditioned building situated on the edge of beautiful open country, within easy reach of two large Midland cities. Excellent facilities exist for all social and athletic activities.

(1) RELAY ENGINEER with wide experience of protective relays required for senior post in a rapidly expanding department.

(2) A fine career in METER ENGINEERING is offered to a young engineer with ideas and enthusiasm. If without previous metering experience, applicant will be given a twelve months' intensive training course assuming B.SC., H.N.C., O.N.C. or equivalent qualification.

(3) An equally good opportunity is waiting for a keen YOUNG ENGINEER in the protective relay department.

All the posts offered are permanent, progressive and pensionable. Apply to Dept. C.P.S., 336/7 Strand, W.C.2, quoting Ref.: 1366. (N 624p)

QUALIFIED ELECTRICAL ENGINEER required for Hydro-Electric Power undertaking in Northern Nigeria, 4,000 ft above sea level, pleasant climate. Comfortable furnished quarters provided, first class passages for self, wife and two children or equivalent benefits if children remain at home. Good salary and pension scheme with liberal leave after 18 months' tour. Apply stating age, full qualifications and experience to Box No. 1053, The E.C. Advertising Co., 54 Old Broad St, E.C.2. (N 515)

RESEARCH LABORATORIES, British Electricity Authority, Leatherhead, require TWO GENERAL ASSISTANT ENGINEERS.

Candidates should have a University degree or equivalent qualifications in Electrical Engineering or in Physics. Duties include research on electrostatic precipitation and allied problems at Leatherhead and Croydon Laboratories.

Salary N.J.B., Grade 5, £531/£732 p.a.

Applications stating age, qualifications, experience and present position and salary should be forwarded to D. Moffat, Director of Establishments, Winsley St, London, W.1, by 3 Dec., 1954. Quote reference ET/541. (N 679)

REPRESENTATIVE required for South of the Thames and London South Eastern Electricity Board area. Pension Scheme in operation. Car owner preferred but not essential. Progressive position. Apply in strict confidence, giving full details of experience, age, salary, etc., to—Box No. 4001, Electrical Times. (N 662)

PRODUCTION ENGINEER

required by a prominent Group with Electrical and Mechanical Subsidiaries in the North West of England. This is a senior appointment and candidates must have had a wide experience in design considerations in relation to repetitive production, preferably in the electrical industry. The position is permanent and pensionable with a starting salary of not less than £2,000 p.a. with considerable opportunity for further advancement. Please apply giving full details of age, education, training and experience to—Box 2J.L. 5129, A.K. Advg, 212a Shaftesbury Ave, London, W.C.2. (N 682p)

TECHNICAL SALES STAFF FOR SOUTH AFRICA

1. TECHNICAL SALES ENGINEER

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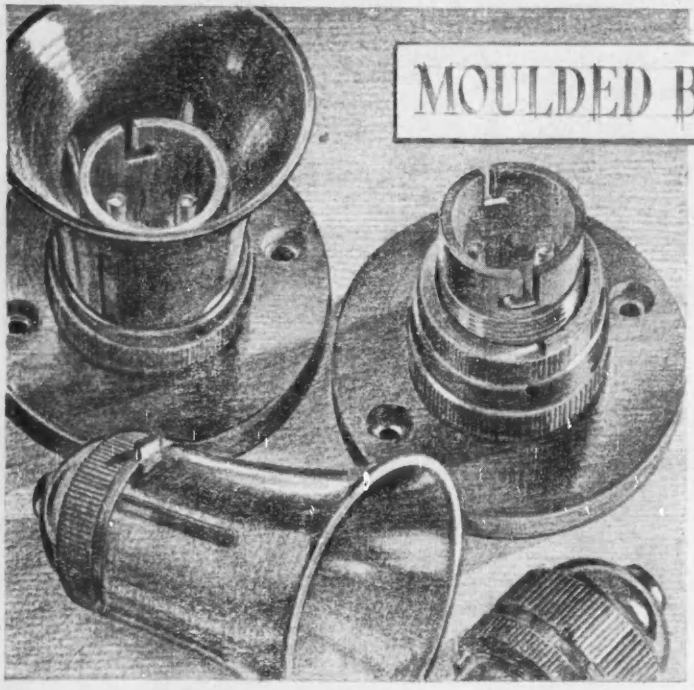

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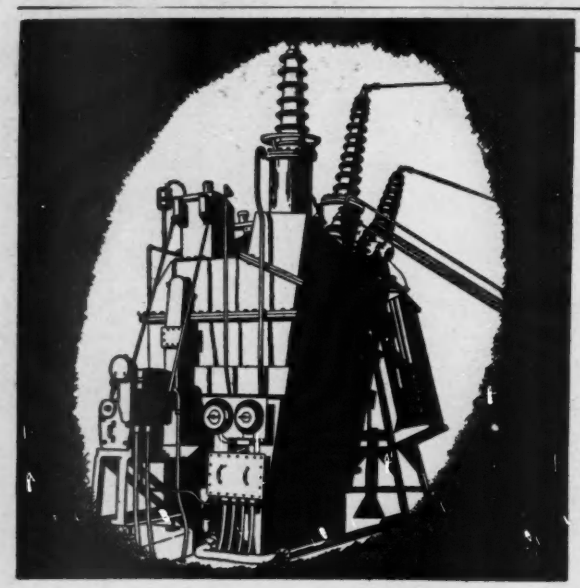

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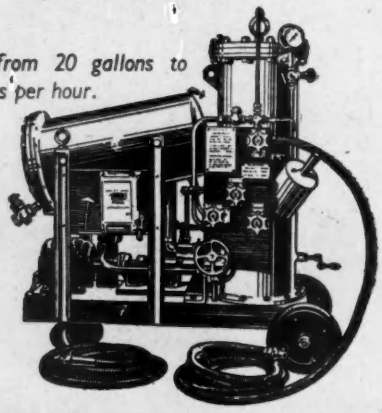

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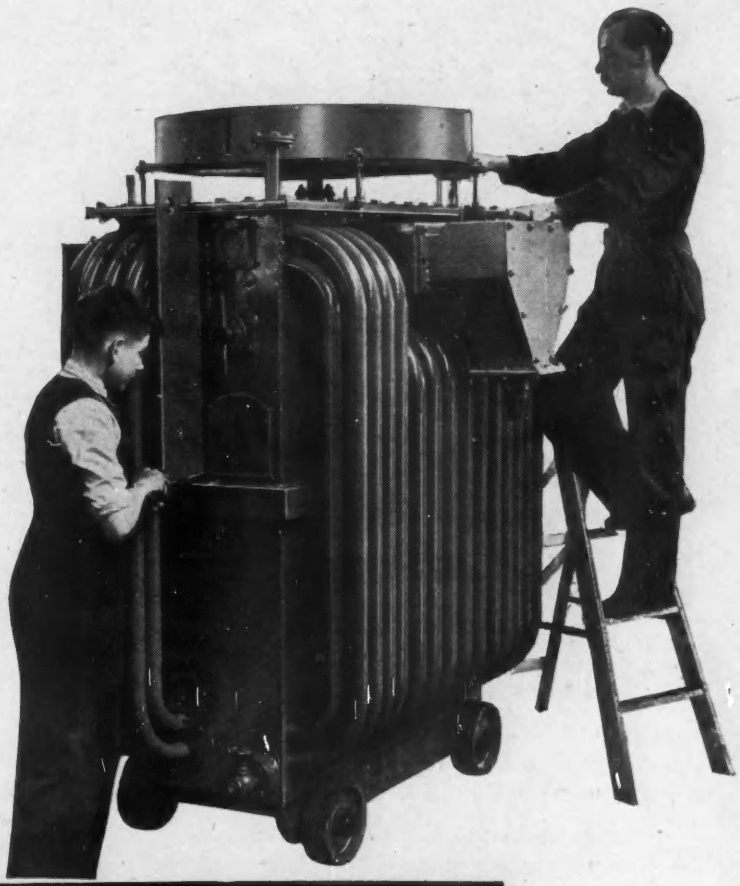

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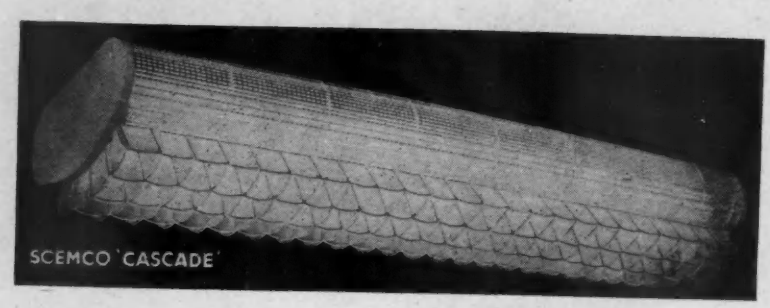

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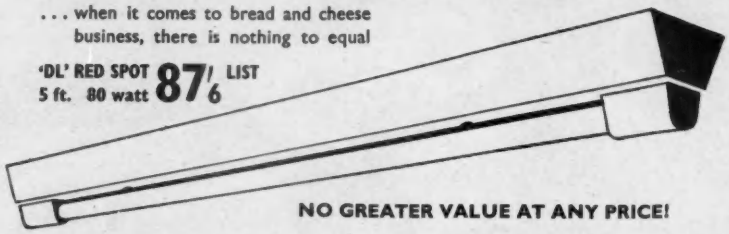

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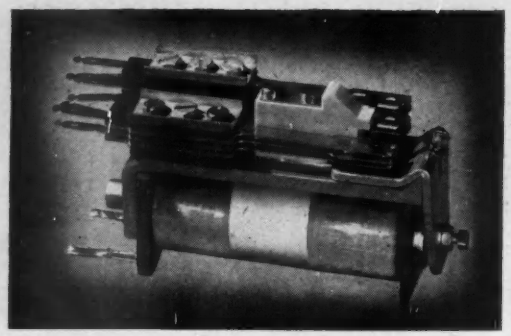

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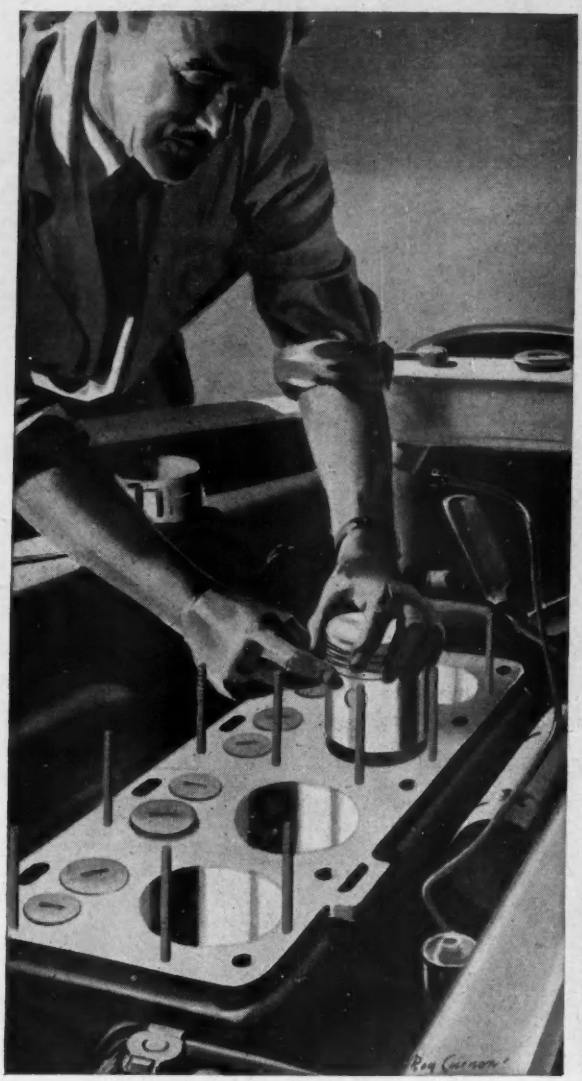

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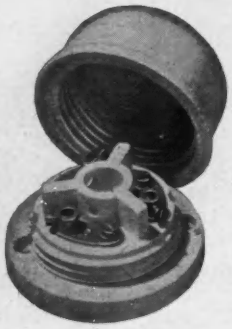

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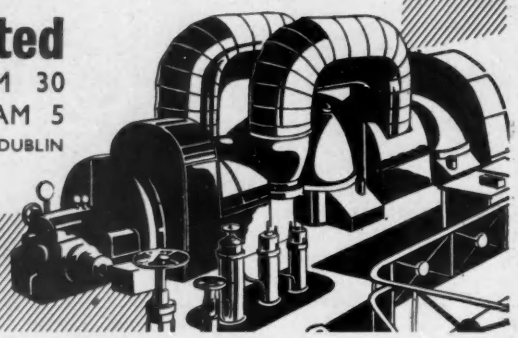

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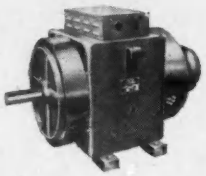

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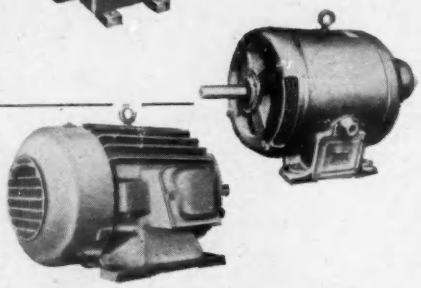

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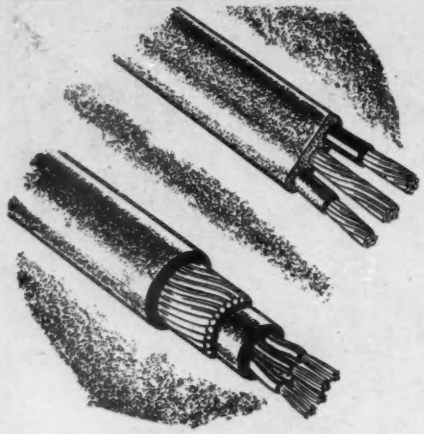

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the THERMOPLASTIC INSULATED CABLE

for DOMESTIC, INDUSTRIAL, and MINING ELECTRICAL INSTALLATIONS

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The polythene insulated cores have a measured insulation resistance of more than one hundred times that of similar rubber insulated material. Furthermore, the dielectric strength is over twice that of similar rubber insulation.

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The p.v.c. sheathing on ASHATHENE Cable provides toughness and flexibility. The cable is unaffected by atmospheric oxidation or prolonged exposure to sunlight. It does not deteriorate through ageing and there is no detrimental effect when it is subjected to chemical action. Unlike rubber, P.V.C. will not support or spread a flame.

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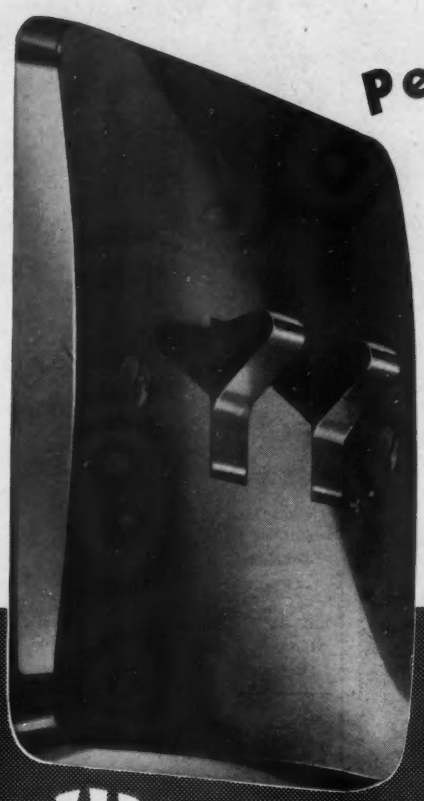

the MK Plateswitch leads

Which of these three ranks first? No matter . . . the MK Plateswitch leads on every count. Certainly the Plateswitch is good: it has successfully completed 100,000 operations on full load in an independent test. It also costs less—less in terms of price; less in the time taken to fix it; and less because the enclosed movement needs no attention throughout its long life. The appearance speaks for itself.

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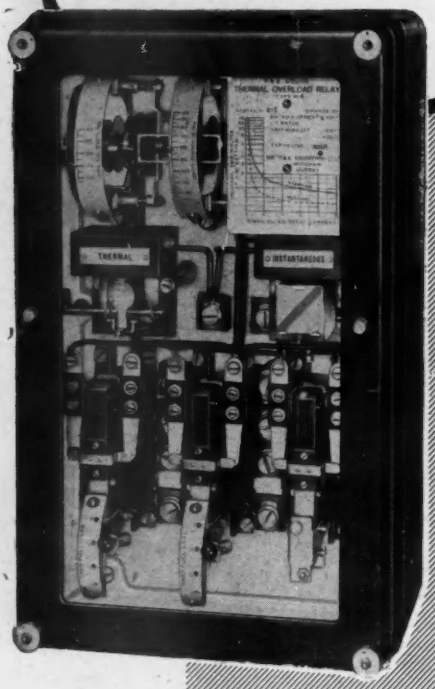
with
P & B Golds' Relays



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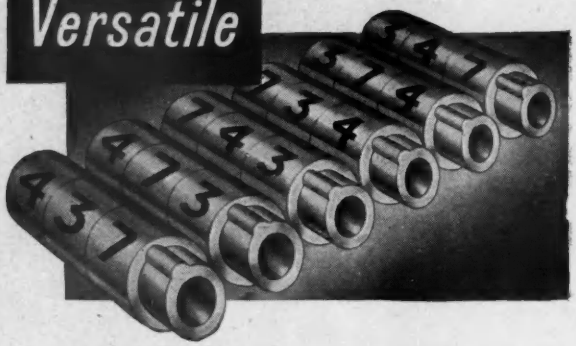

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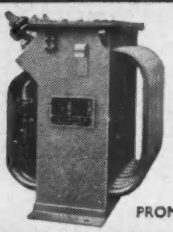

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with such Big capacity such a wealth of features such economy in running

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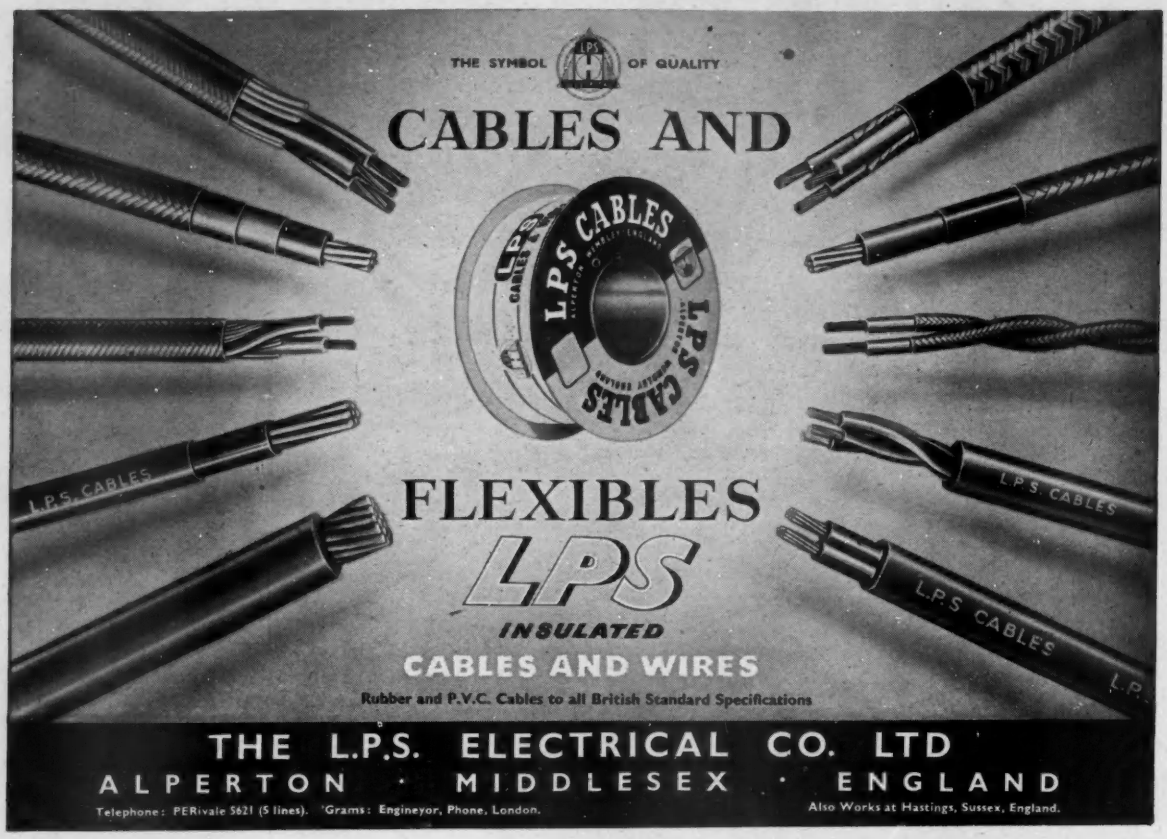
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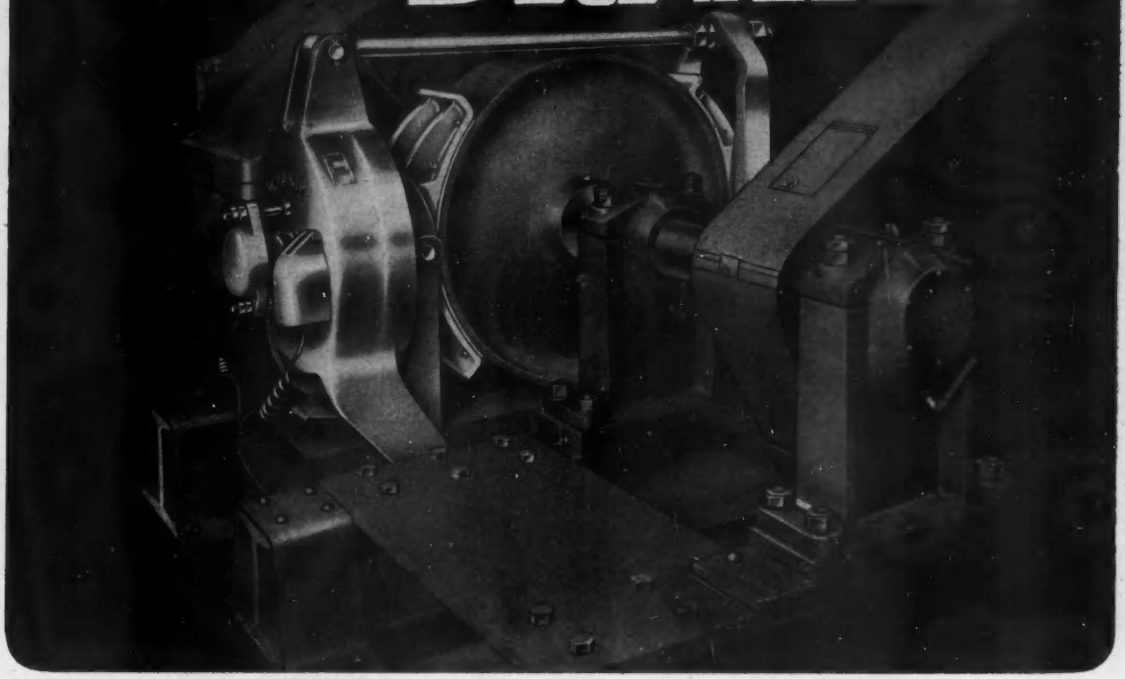

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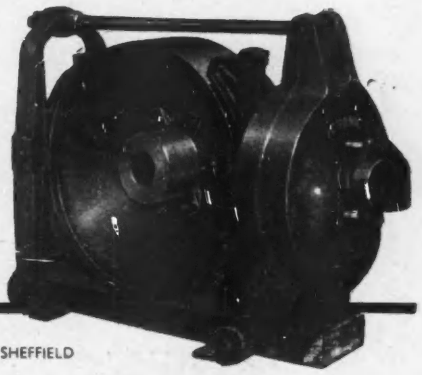

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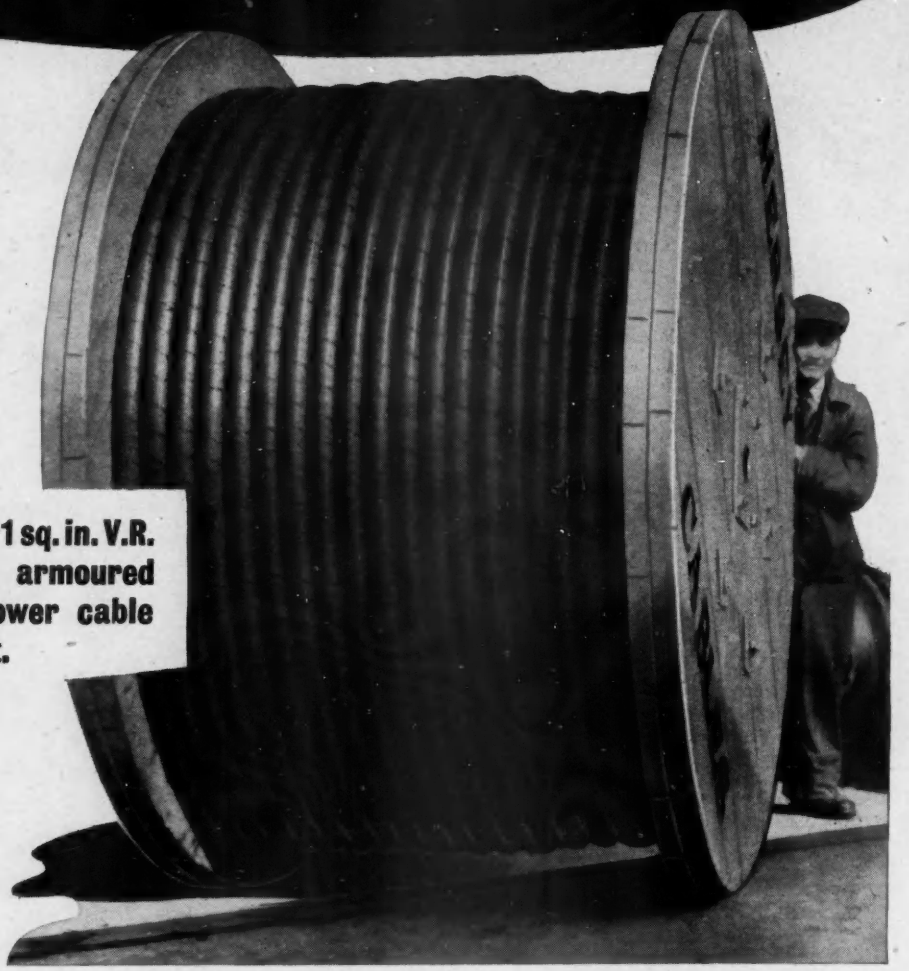

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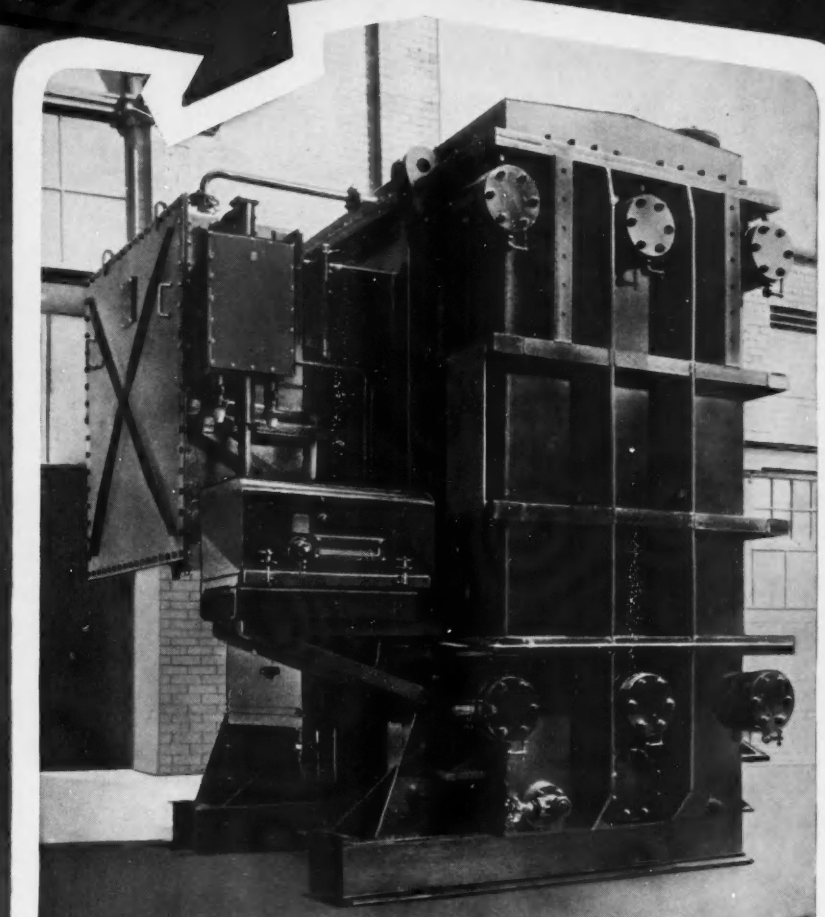

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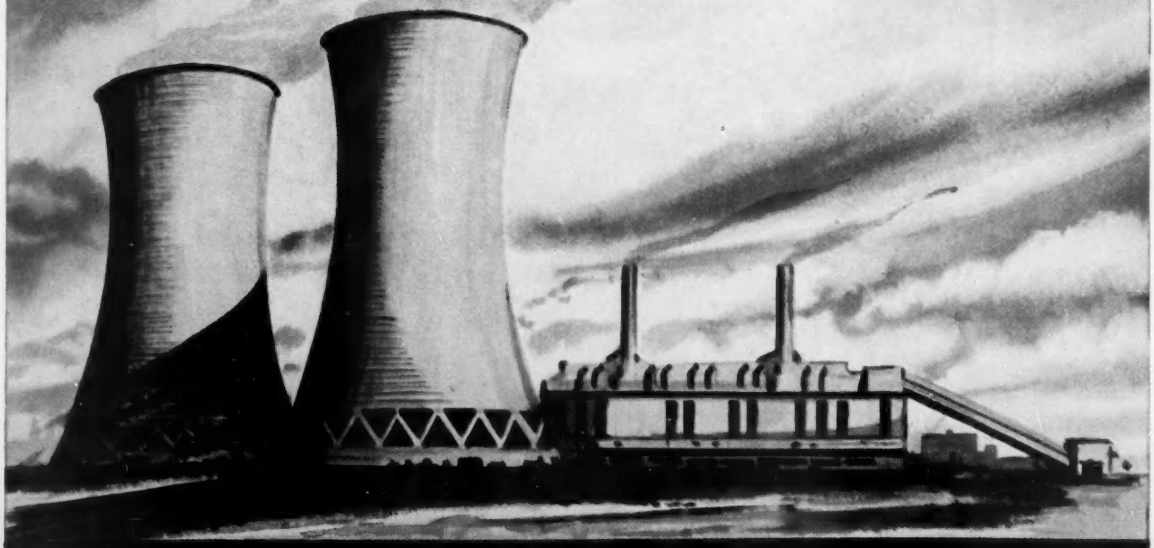

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